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The Impact of Domestic Passenger Transport on International Tourism Development

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Abstract: The overall objective of this paper is to study the prospects for the development of domestic transport of passengers in selected countries for the next five years and to establish the correlation between domestic transport of passengers and travel and tourism (T&T) industry's contribution to GDP in these countries, as well as the suburbanisation of Ukraine, Poland, the USA, China and India. The analysis of the forecast of the dynamics of domestic transport of passengers in comparison with the dynamics of GDP per capita and the CPI allows us to state that in the next 5 years the economies Poland, China and India will expand (i.e. there will be GDP per capita growth) for each of the projected scenarios (realistic, optimistic and pessimistic). The only exception is Ukraine, where this figure will be 95-96% depending on the selected scenario. The conducted research shows that from 2021 to 2025, the projected GDP per capita growth in Poland will amount to 12.03%. According to the realistic forecast, this will affect the increase in domestic transport of passengers, which will amount to 120.8%, with a decrease in the CPI to the level of 32.8%. The United States and India will demonstrate similar patterns. Particularly, the projected GDP per capita growth in the US will amount to 106.1%, while domestic transport of passengers will be equal to 108.9% and the CPI will fall to 86.8%. At the same time, in India the GDP per capita is expected to reach 118.7%, with domestic transport of passengers amounting to 169.4% and the CPI amounting to 57.6%. Hence, the analysed indicators suggest that the economic situation in Poland, USA and India will facilitate the transport industry's development in the subsequent 5 years.

Key words: transport industry, international tourism, transport of passengers, GDP; forecast.

JEL: L91; L83; F43

Introduction

Transport is a popular research topic that is analysed from many standpoints. One of the perspectives is the relationship between transport and tourism (Borkowski et. al, 2021). Experts believe that transport infrastructure is the decisive factor in the attractiveness of a tourist destination, as it provides a vital basis for the provision of tourist services (Khadaroo et. al., 2008). Many studies see transport as a key component of the tourism system and an important economic sector for countries, which has a great importance to increasing

competitiveness, social development, and integration (Koziuket. al., 2019; Klapkivet. al., 2020; Vovk et. al., 2018). Transport is an important instrument for ensuring mobility, as well as contributing to the free movement of people in the internal market (Transport in the European Union, 2019), hence, it leads to changes in the general tourist flows. Quite often, well-known scholars consider transport networks to be one of the most imperative components of successful tourism development, arguing that "transport plays an important role in the successful creation and development of new attractions as well as the healthy growth of existing ones" (Kaul, 1985). However, even though many authors acknowledge the importance of transport for successful tourism development, the study of the strength of the relationship between tourism and passenger transport has not been given much attention in the existing literature so far.

The overall objective of this paper is to study the prospects for the development of domestic transport of passengers in selected countries for the next five years and to establish the strength of the relationship between domestic transport of passengers and travel and tourism (T&T) industry's contribution to GDP in these countries. The study will consist of two parts: the first concentrates on forecasting the dynamics of domestic transport of passengers in selected countries until 2025 on the basis of actual data for 2010-2018 in comparison with the dynamics of GDP per capita and the Consumer Price Index (CPI) of these countries, and the second part examines the closeness of the relationship between the transport and tourism industries in 2010 – 2018.

Theoretical premises

Transport is a vital component of national and global economies. Acceleration of the interaction of all economy sectors necessitates the constant development and improvement of the transport sector. The growth of industrial production and international trade requires changes in the global transport sector and it surely becomes a key globalisation factor. According to the World Bank, in 2018, global transport services accounted for a total of 19.2% of global services exports, while imports of sea, air, land, internal waterway, space, and pipeline transport accounted for a total of 22.6% (The World Bank, 2021).

Research shows that passenger traffic growth depends on many factors, including geographical location, GDP, total population, and human development index. Nonetheless,

the significance of these factors varies for different countries. In particular, Japan, Nigeria, Spain, Turkey, Brazil, the United Kingdom, China, India, and the United States demonstrate the greatest relationship between passenger traffic and the geographical location of the countries (Inan et. al., 2021).

The regional distribution of industrial production depends on the development of transport infrastructure, although, on the other hand, the transport sector significantly dependents on the development of material goods, as they require the use of transport in order to perform their tasks. Similarly, the tourism business adapts to the transport infrastructure, as for this business transport of passengers does not only provide the logistical support for tourists aiming to deliver them to their destinations (Khan et. al., 2017), but it also serves as an important resource for social and economic development of the corresponding tourist region. The decision-makers increasingly more often use regional development tools for both the transport sector and the tourism industry, as these two industries are viewed as partners in tourism services chain (Bezerra et. al., 2019). J. Khadaroo & B. Seetanah believe that the government should integrate transport policy into tourism planning, especially for countries with poor infrastructure, as investment in tourism infrastructure, marketing efforts and air transport liberalization may be futile without consistent financial support of the state for the transport infrastructure's needs. The scientists emphasize that policy makers should develop an integrated, efficient and affordable transport system that is sustainable from social, economic and environmental points of view. Broad participation of different interest groups, particularly from the tourism sector and consumers, is essential for the effectiveness of such planning (Khadaroo et. al., 2008).

In his paper, C. Puchongkawarin discusses the close link between transport and tourism (Puchongkawarin et. al., 2020); the aforementioned study states that improving transport logistics leads to improved quality of tourism services. With the use of mixed research methods based on quantitative and qualitative analysis, the authors were able to confirm that the optimisation of transport routes leads to increased satisfaction of tourists with the services. Tourism brings strategic value to transport of passengers and offers a selective business method for the introduction of tourism in transport companies (Xiuting, 2006). Providing appropriate transport can turn the so-called "dead" tourism centres into active and prosperous places that attract many people. An attractive transport system considerably depends on the quality and accessibility of transport infrastructure, which includes air

transport and airports, land transport systems and routes, as well as water transport infrastructure (Xiuting, 2006). In reality, the transport system is responsible for the connection between the places of tourism origin and tourist destinations, as well as for providing transport connections within the tourist destination, i.e. hotels, shops, attractions, etc. (Khadaroo et. al., 2008). Furthermore, the positive effect of pleasant tourist impressions can be extrapolated to the judgment of passengers about their tourist destination (Bezerra et. al., 2019). Therefore, transport infrastructure contributes to tourist demand (Khadaroo et. al., 2007).

Development directions of the world economy have fundamentally influenced changes in transport, which has become an indispensable element of modern social and economic processes (Motowidlak, 2017). The idea of sustainable development and the need to adjust the transport development strategy in the European Union to follow it, have been exposed in the White Papers on Transport, where the development of competitive transport is connected with the efficient use of resources, for almost three decades. The paradigm of sustainable development is based primarily on the policy of economic interventionism, whereas the globalisation processes result from the basic mechanisms of the market economy, mainly competition (Kumar, 2021). Studying sustainable transport in the world economy and in the economies of individual countries is a justified research direction (Liu, 2003). This issue requires further analysis in relation to the economies of individual countries.

Nicole Adler et al. argue that transport infrastructure development in a particular country depends on many factors related to market indicators in the transport network, including the behaviour of players in the transport market (Adler et. al., 2021). In their paper, Qi Cuia et al. clearly demonstrate the vast impact of the currently ongoing COVID-19 pandemic on transportation and non-transportation sectors, as well as on China's macro-economy (Cuia et. al., 2021).

A country's economic development is closely linked with the development of its transport infrastructure, the transportation business activity, and its transit potential. These components are the roots of every business. At the same time, transport of passengers is a significant part of transportation services in each country. Furthermore, it also forms the added value of the industry. Passenger transportation companies decide to expand their business, including abroad. In this situation, they have to determine the priority areas of passenger traffic flow. We should underline that transport of passengers also has

a significant impact on the development of tourism business. Then, tourism and its development are based on a combination of various social, cultural, economic, and transport factors in each country.

Methodology

In order to analyse the situation in Poland and Ukraine more objectively, we have additionally selected the United States, India, and China as the countries that had been considered the most powerful states over the last decade in terms of their transport of passengers.

The initial data of the study include the indicators of local transport of passengers, which are reflected in the EU ODP (The European Union Open Data Portal, 2021), GDP per capita and Consumer Price Index (CPI) from Trading Economics portal (Trading Economics, 2021a; Trading Economics, 2021b), as well as indicators of travel and tourism (T&T) industry's contribution to GDP, which are reflected in the World Economic Forum Travel and Tourism Competitiveness Reports (World Economic Forum, 2011-2019).

We used the statistical analysis functions of MS Excel as research methods. While forecasting transport of passengers, we used the Excel FORECAST.ETS function, in order to calculate the confidence interval, we addressed the FORECAST.ETS.CONFINT function with a probability of 0.95, which returns a confidence interval for a forecast value at a specific point on a timeline. The results of the latter calculations are reflected in the graphs using low probability binding and high probability binding lines.

Results

According to the aforementioned research results, social and economic indicators affect the movement of people by transport (Erik et. al., 2021). Social and economic indicators change not only within the society, but in general from country to country.

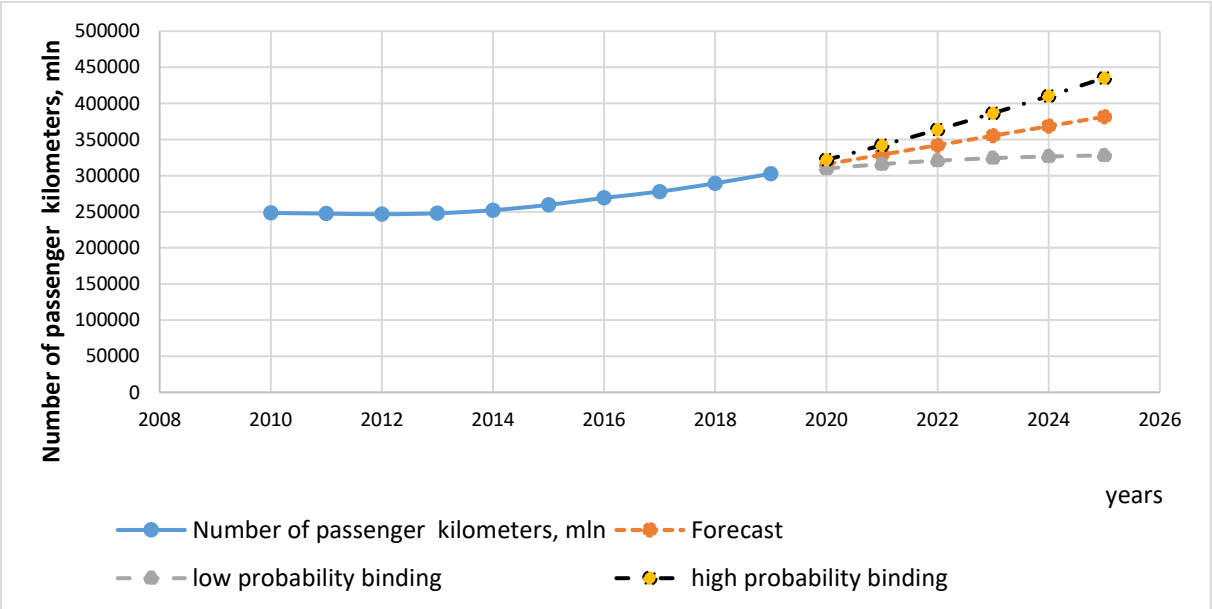
It is worth mentioning that market indicators also impact the state of the transport industry in a country, as they attract both competition and cooperation within the state (Adler et. al., 2020). Hence, it is essential to study the dynamics of the transport industry in particular countries.

Our paper presents an analysis of the transport development and the relationship between this industry and tourism in countries such as Poland, Ukraine, USA, China and India. The choice of Poland and Ukraine for the study is due to the origin of the authors of the article. At the same time, the United States and China are the world's leading economies with the world's most powerful transportation systems and significant tourism potential. As a counterbalance to the US and China, we selected India as the country that, despite its relatively low economic status, has the strongest use of its own transportation system. We will study the situation with regard to domestic passenger transport in more detail for each of the above-mentioned countries and assess the forecast indicators with the use of low probability binding and high probability binding lines.

The transport industry plays a key role in Poland's economy. GDP growth in the transport sector is higher than the country's overall GDP growth rate. 70% of the country's passenger transport accounts for passenger cars, i.e. light duty vehicles. However, over the past few years, the volume of air traffic has also increased significantly. From 2008 to 2016, this sector grew at an average annual rate of 3%.

After the end of the financial crisis of 2007–2008, also known as the global financial crisis (GFC), there has been an increase in domestic transport of passengers in Poland, which is also evident in the future trends (Fig. 1).

Figure 1. Dynamics and Forecast of Domestic Transport of Passengers in Poland

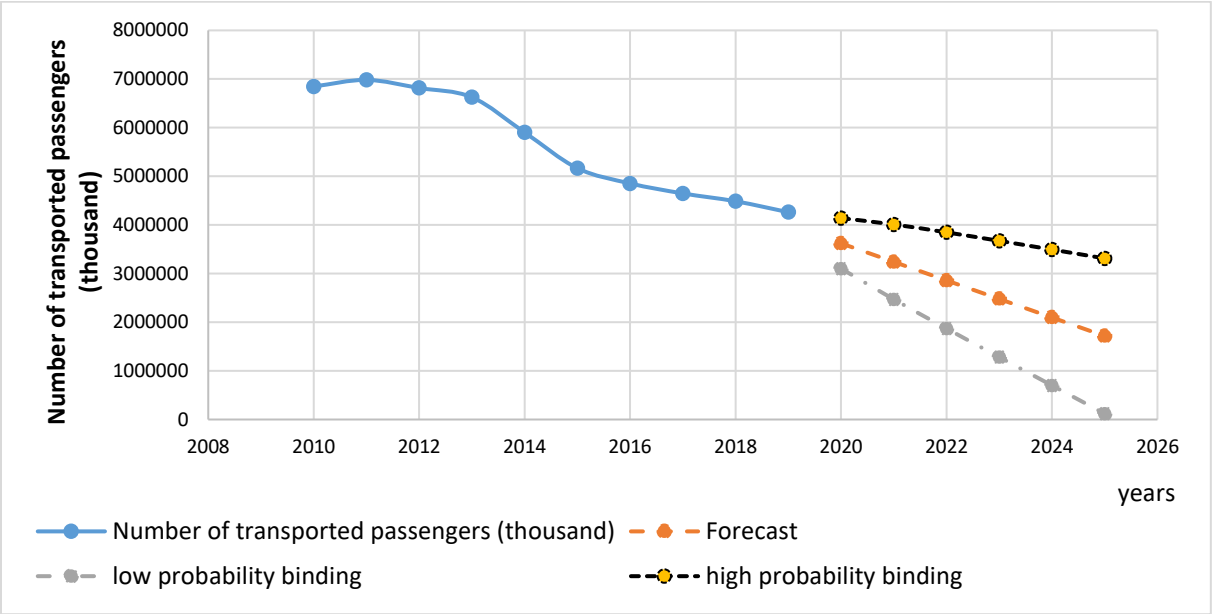


Source: own study, based on The European Union Open Data Portal (2021)

The access to the EU-28 freight market also facilitated the growth of transport of freight, which certainly affected changes in transport of passengers. According to Eurostat, the GFC that began in 2008 had led to a significant reduction in transport over the next 4 years. The freight transport, which in 2008 amounted to 1.89 trillion tonne-kilometres (tkm), in the years 2009-2013, fell to the range of 1.69-1.77 trillion tkm. Only in 2017, the transport sector increase helped to get above the pre-crisis year (PwC, 2019). During the period from 2009 to 2013, the negative dynamics in freight transport was accompanied by negative dynamics of GDP, however in subsequent years, GDP growth was accompanied by even higher growth rates of the transport sector, which clearly indicates the high dependence and vulnerability of this industry to changes in GDP. The growth of GDP and foreign trade, among other reasons, is partly due to the entry of Polish hauliers into the export market of transport services. Presently, hauliers from Poland rank first in total transport operations of the EU-28, leaving German and French hauliers behind.

As we can see from Figure 2, in Ukraine, the use of transport by Ukrainian passengers is declining and the forecast in this regard is also quite unfavourable. Particularly, the reduction of passenger flows due to the military conflict in the East of the country had a significant impact on the negative dynamics of the indicators. In order to overcome these negative phenomena, there is an obvious need to both make changes to national legislation and cooperate with other countries in the field of transport. It is good to note that some steps in this direction are already being taken. For instance, they include the adoption of the Resolution of the Cabinet of Ministers of Ukraine No. 180, dated February 2018, "On Amendments to the Tender Procedure for Passenger Transportation on a Public Bus Route", according to which "contests for interregional bus routes will now be held on an application basis" (Resolution of the Cabinet of Ministers of Ukraine, 2018). There will also be an opportunity for those carriers who have upgraded their fleet of vehicles to extend the permits.

Figure 2. Dynamics and Forecast of Domestic Transport of Passengers in Ukraine



Source: own study, based on The European Union Open Data Portal (2021)

In order to improve the situation in the field of transport, the government implements the applicable legal provisions declared in the Association Agreement between the European Union and Ukraine. Article 368 of the Association Agreement foresees facilitation of the restructure and renewal of the transport sector of Ukraine and the gradual harmonisation of existing standards and policies with those in the EU.

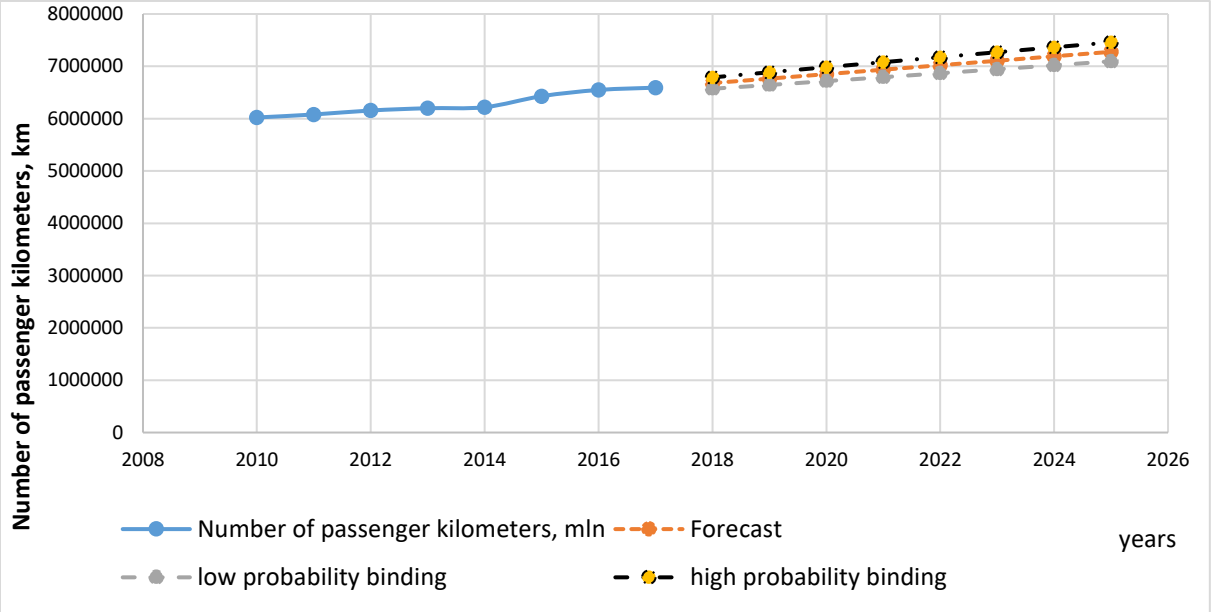
The development of concession roads in Ukraine, which will increase the transport of passengers by road, is a positive phenomenon in this area.

Today, one can also see that the convenience of purchasing transport tickets is growing. For instance, in 2020, the passengers of Ukrainian Railways (Ukrzaliznycia) bought 66% of tickets online (Ministry of Infrastructure of Ukraine, 2021).

Presently, the Verkhovna Rada of Ukraine (the unicameral parliament of Ukraine) is considering draft legislation on public-private partnership in the road sector, which stipulates the involvement of private investors for road construction. The payback of the projects is planned for 20-30 years after the completion of construction and will depend on the quality of the road, which is built and subsequently maintained. There will not be road tolls for citizens. At the same time, poor road maintenance and non-compliance with accepted standards may lead to fines.

In the United States, domestic traffic is growing and, according to our forecast (Fig. 3), this trend will continue. However, the predicted growth will be slow.

Figure 3. Dynamics and Forecast of Domestic Transport of Passengers in the USA



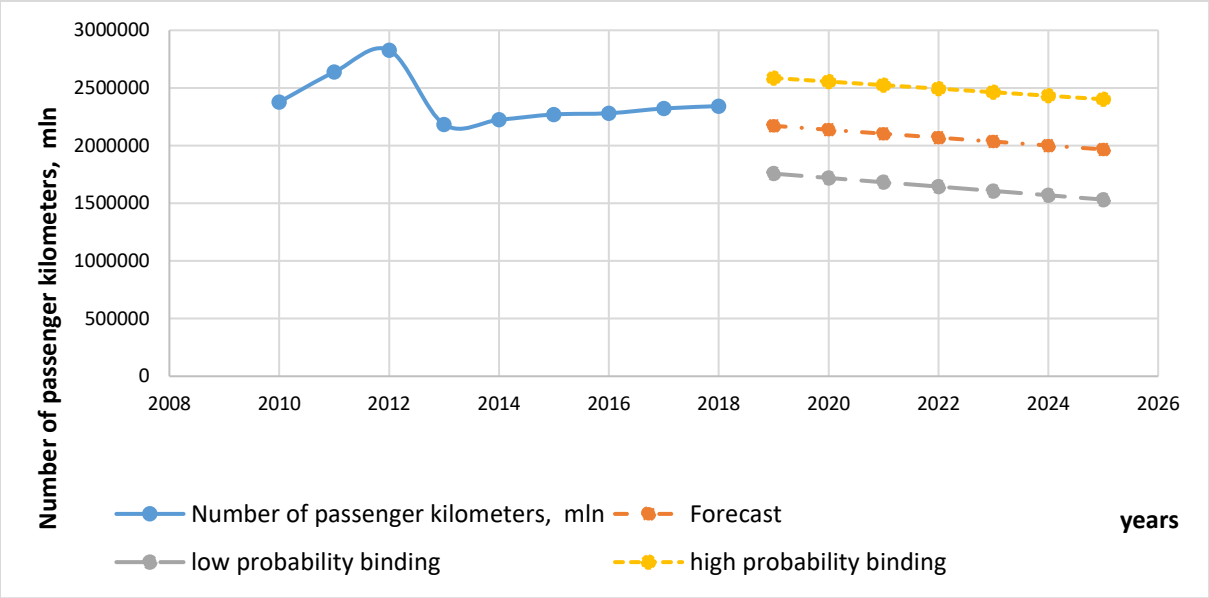
Source: own study, based on The European Union Open Data Portal (2021)

The slow pace of the growth of US domestic traffic has a number of reasons, namely the following:

1. The majority of citizens more and more often use personal transport because cars and fuel are getting cheaper.
2. More and more Americans prefer used cars because they are cheaper and at the same time meet quality requirements.
3. Nowadays more Americans prefer to travel abroad because of the economy and social life globalisation trends, as well as the development of the international business component.
4. Many issues are solved without leaving the offices, online, so the number of business trips has reduced.
5. Foreign tourism replaces domestic tourism due to the promotion in social media and posts with photos of landscapes or views of other countries.
6. International air travel has become very cheap for Americans. Thus, domestic transport is not used as actively as before.

In China, there are some fluctuations in domestic transport of passengers, while in general the domestic transport is declining (Fig. 4).

Figure 4. Dynamics and Forecast of Domestic Transport of Passengers in China

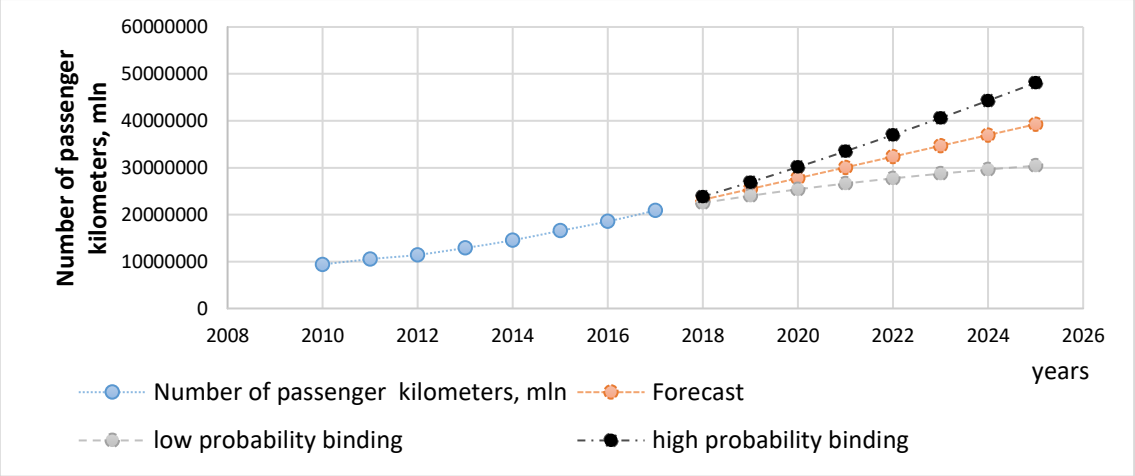


Source: own study, based on The European Union Open Data Portal (2021)

These trends became especially evident due to the rapid emergence and spread of the coronavirus disease (COVID-19) in the country. Nonetheless, over time the situation gradually began to improve. Hence, in case of Chinese railways, there is an increase in the number of passengers due to the resumption of production and improvement of the economic situation. In particular, there is currently an increase in rail passenger transport (in number of passengers) by an average of 60 thousand people per day. For example, CSR Company, a locomotive manufacturer, organised 115 charter trains and it carries 123,000 workers daily from their places of residence to work. The number of stops is as low as practicable. Simultaneously, the company strives to ensure a safe and orderly resumption of work. Essentially, 199,000 workers resumed work in 2,817 divisions of the company. The relevant teams implement 90 key railway projects at these production sites. All of the noted projects are directly related to the transport industry. It is worth mentioning that in order to strengthen the work on COVID-19 prevention, the corporation cooperates with local authorities on a large number of construction sites. In total, the country's railways have transported more than 181,000 tons of cargo related to the control and prevention of the spread of COVID-19.

India has demonstrated a rapid increase in the transport of passengers; both in recent years and according to the forecast (Fig. 5). In this country, due to the pandemic, in March 2020, the transport of passengers has been suspended completely. Nonetheless, in May, the government restored the transport services. On May 25, 2020, two months after a lockdown to curb the spread of coronavirus and subsequent ban of flights, India partially resumed regular passenger flights. However, so far only domestic flights between the Indian states have been resumed.

Figure 5. Dynamics and Forecast of Domestic Transport of Passengers in India



Source: own study, based on The European Union Open Data Portal (2021)

Indian citizens greeted the resumption of commercial passenger traffic with caution. According to local media, the flights carried only 25-50% of passengers out of their pre-covid capacity. Moreover, after the pandemic, most passengers prefer to travel not only in masks, but also in personal protective suits and in gloves.

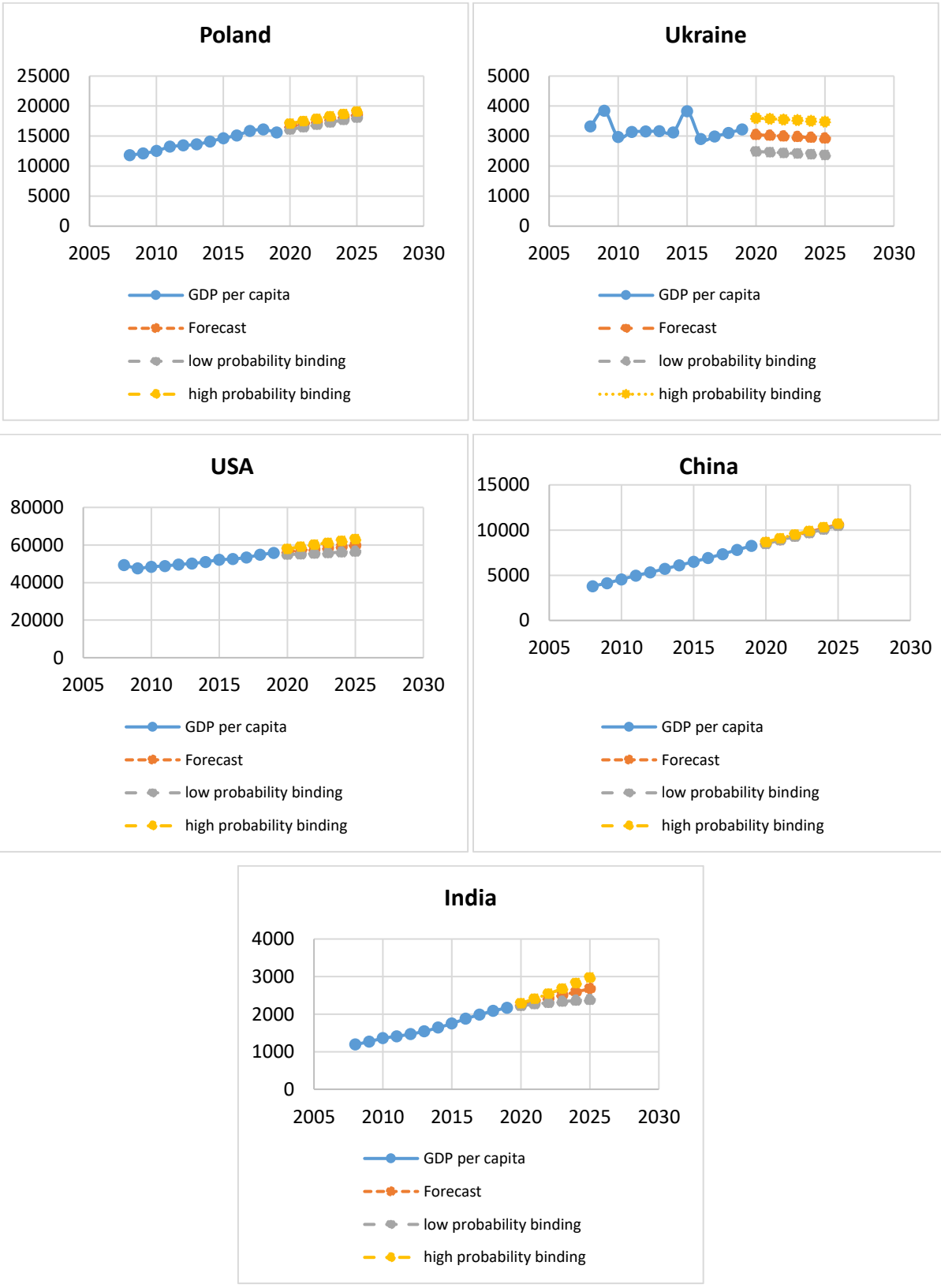
Overall, in India one can travel around the country not only by standard, but also by less common types of transport: from public and private buses and an extensive rail transport network to low-cost aviation segment and rickshaws, which are quite exotic for Ukrainian and Polish tourists.

In order to fully assess the forecast of domestic transport of passengers in Poland, Ukraine, the United States, China and India, there is a need to pay attention to GDP per capita of these countries (Fig. 6) in combination with the dynamics and forecast of the Consumer Price Index (Fig. 7).

As the analysis of the charts shows, GDP per capita is growing in all countries, and growth is close to a linear function with high accuracy, which is illustrated by small deviations in confidence intervals, except for Ukraine, which has in recent years demonstrated an improving trend. This suggests that the economies of Poland, the United States, China and India are growing along with the growth of the population in these countries. According to the World Bank data, the economic growth rates of China and India in the 21st century are much higher than the world average, despite the fact that the population of these countries is over a billion people. This was primarily due to the financial reforms that began in China in the late 1970s and in India in the mid-1990s. Hence, it can be argued that the governments of Poland, the United States, China and India have managed to create self-sufficient economies, which, according to the forecast analysis, will continue to improve the standard of life and wellbeing of their citizens in the ensuing years.

Consumer Price Index, which, according to the forecast, indicates a trend toward decline, evidently confirms the growing efficiency of economic policy of these countries. The charts depicted in Figure 7 show pronounced fluctuations, although the forecast for all countries shows a decline in this indicator. In reality, the purchasing power of the currencies of Poland, the United States, China and India will increase. This tendency will allow the citizens of these 4 countries to hypothetically spend more on their needs, which include transport and tourism. At the same time, one can observe less optimistic changes in Ukraine. However, the data in Figure7 indicate that the gaps in the confidence intervals are very large due to significant fluctuations, and therefore the trend is traced with significant errors.

Figrue 6. GDP per Capita Dynamics and Forecast in Poland, Ukraine, USA, China and India



Source: own study, based on The European Union Open Data Portal (2021)

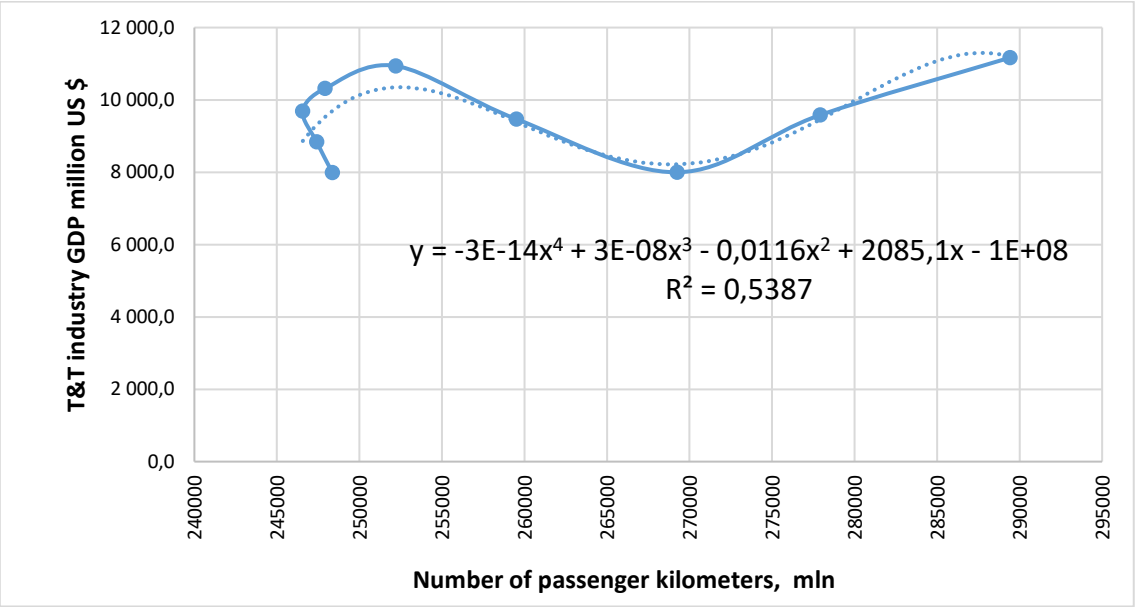
Fig. 7. Consumer Price Index Dynamics and Forecast in Poland, Ukraine, USA, China and India

Source: own study, based on The European Union Open Data Portal (2021)

It is possible to establish the closeness of the relationship between the transport and tourism industries by finding the dependencies and nature of the relationship between the dynamics of domestic transport of passengers and the dynamics of the contribution of tourism and travel to GDP. The term 'tourism' is intended to refer to T&T industry GDP, provided by the World Travel & Tourism Council, Tourism Satellite Account Research (World Economic Forum, 2011; World Economic Forum, 2013; World Economic Forum, 2015; World Economic Forum, 2017; World Economic Forum, 2019).

Figure 8 clearly demonstrates that, even with small number of passenger-kilometres, the number of tourist trips in Poland does not significantly change. We believe that this phenomenon can be linked to the following travelling tendencies: people use mainly own cars for short distance tourist trips, they combine business trips and visiting close relatives with visits to tourist attractions. However, with the increase in passenger-distance (in km), there is a correlation between these two indicators. This dependence is close to the fourth-degree polynomial (also known as a quartic polynomial). Nevertheless, the standard deviation is not acceptable (R^2=0.5387) due to the lack of connections at low number of passengers transported.

Figure 8. Dependence of Tourism on Domestic Transport of Passengers in Poland

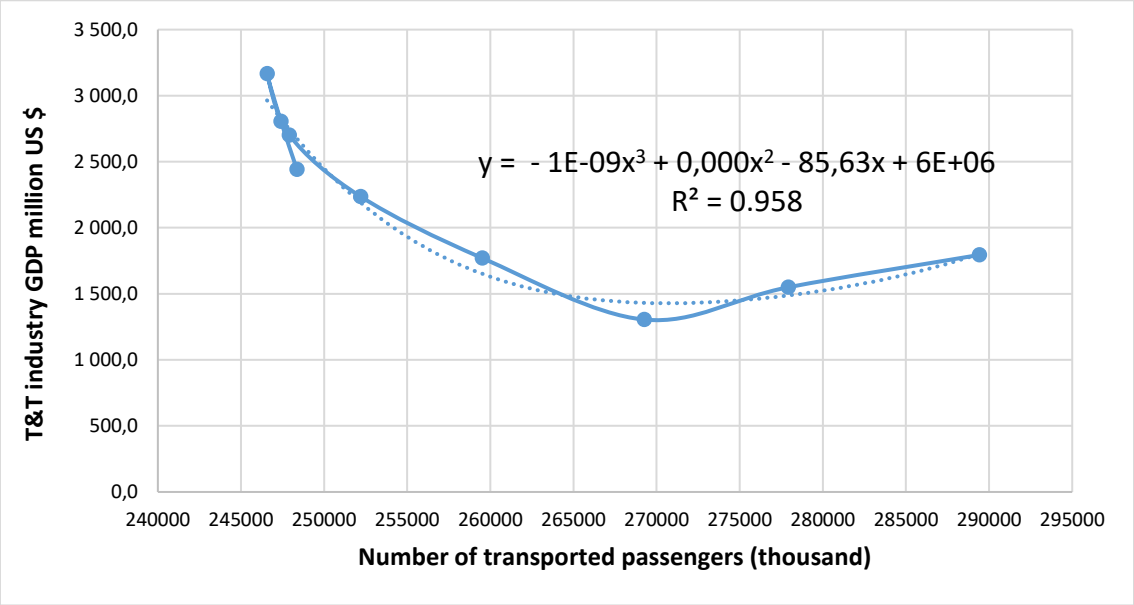


Source: own study, based on The European Union Open Data Portal (2021), World Economic Forum (2011-2019)

Ukraine is in a different situation (Fig. 9). The country has a low passenger flow on domestic transport and demonstrates the growth of domestic transport of passengers;

however, even given these predispositions, tourist activity is declining. Nonetheless, with large values of the first indicator, the number of tourist trips increases, i.e. there exists a correlation at high values of domestic transport of passengers, which is similar to the situation in Poland. This trend is related to the fact that tourists in Ukraine mostly choose long trips. These options seem to be more interesting for Ukrainians. They state that, in case of short distances, they can explore the region either during business trips, or while visiting close relatives. With that, the dependence curve is close to the curve of the fourth-degree polynomial with an acceptable value of R^2=0.9581, which indicates a high accuracy of the approximation.

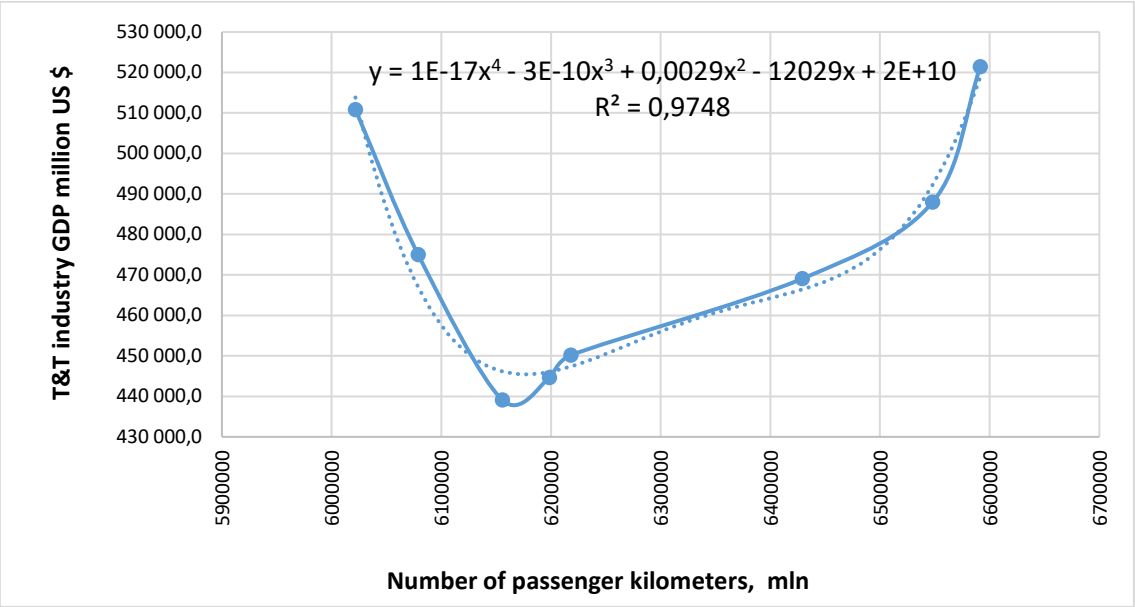
Figure 9. Dependence of Tourism on Domestic Transport of Passengers in Ukraine



Source: own study, based on The European Union Open Data Portal (2021), World Economic Forum (2011-2019)

In the United States, the sector has the same features. From our perspective, this can be explained by the same arguments as in Ukraine (Fig. 10). The approximation also occurs by the fourth-degree polynomial. In this case, we have a high value of R^2=0.9748.

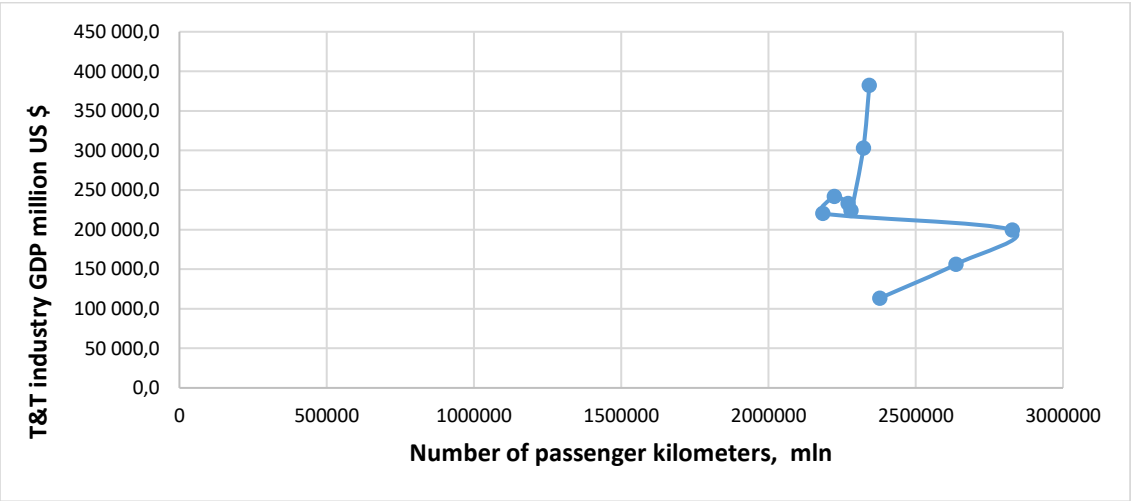
Figure 10. Dependence of Tourism on Domestic Transport of Passengers in the USA



Source: own study, based on The European Union Open Data Portal (2021), World Economfic Forum (2011-2019)

In China, there is actually no link between domestic transport and tourism (Fig. 11). We theorize that this is mainly due to the fact that the vast majority of the Chinese prefer tourist trips abroad due to the growth of their wealth (Kaigorodovaet. al., 2018). Moreover, if we analyse the geographical location of UNESCO World Heritage Historical and Cultural Sites in China, we can see that out of the 52 monuments, only 8 are located in the remote north-western provinces of the country, while 44 are closely located on Southeast of the country.

Figure 11. Dependence of Tourism on Domestic Transport of Passengers in China

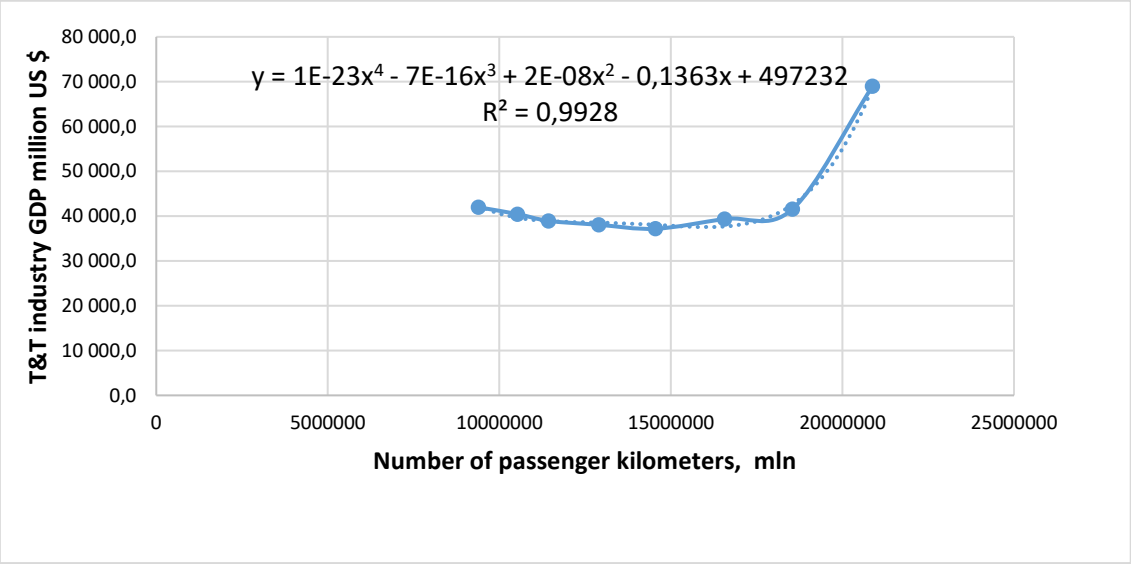


Source: own study, based on The European Union Open Data Portal (2021), World Economic Forum (2011-2019)

In India, the situation is similar to Ukraine, the United States and Poland (Fig. 12). As in the aforementioned countries, at low values of passenger-distance (km), there is a slight decline in tourism sector with increasing passenger flow. Nevertheless, at its large values there is a noticeable increase. The study can provide the same explanation as for the stated countries. The approximation of the fourth-degree polynomial is acceptable, since R2=0.9928 is very substantial.

Hence, the tourism dynamics in Poland and Ukraine have a similar interdependence. The countries develop transport infrastructure and continue to form the legislative field for the development of the transport industry. The processes of transport infrastructure development and the dynamics of the transport of passengers are similar to the noted processes in such countries as the United States and India. The transport infrastructure development and the volume of the transport of passengers greatly affect the structure and capacity of the tourism industry.

Figure. 12. Dependence of Tourism on Domestic Transport of Passengers in India



Source: own study, based on The European Union Open Data Portal (2021), World Economic Forum (2011-2019)

As opposed to these countries, China has its own representation of dependencies. The reasons for this phenomenon include the following: China has developed state regulation of the national economy, as officially the People's Republic of China calls its system "building socialism with Chinese characteristics", the peculiarities of the location of historical and cultural sites in the country, distinctiveness of the distribution and methods of overcoming COVID-19, and the areas of cooperation between transport corporations and the state.

Summary

The analysis of the forecast of the dynamics of domestic transport of passengers in comparison with the dynamics of GDP per capita and the CPI allows us to state that in the next 5 years the economies Poland, China and India will expand (there will be GDP per capita growth) for each of the projected scenarios (realistic, optimistic and pessimistic). According to the study, the only exception is Ukraine, where this figure will be 95-96% depending on the selected scenario. The conducted research shows that from 2021 to 2025 the projected GDP per capita growth in Poland will amount to 12.03%. According to the realistic forecast, this will affect the increase in domestic transport of passengers, which will amount to 120.8% with a decrease in the CPI to the level of 32.8%. The United States and India will demonstrate similar patterns. Particularly, the projected GDP per capita growth in the US will amount to 106.1%, while domestic transport of passengers will be equal to 108.9% and the CPI will fall to 86.8%. At the same time, in India the GDP per capita is expected at 118.7%, with domestic transport of passengers amounting to 169.4% and the CPI to 57.6%. It is worth stressing that among these three countries, India has the largest volume of domestic passenger traffic, with a growing GDP per capita. In China, the forecast is also curious, i.e. in the next 5 years the country will have a growing GDP per capita at 123.5%, domestic transport of passengers is expected to decrease to 90.6% with the CPI equal to 73.0%. In this regard, Ukraine will be the country with the bleakest future, as in 2025 GDP per capita is expected to be 96.2% compared to the figure in 2021. At the same time, domestic transport of passengers is estimated at 47.4% of the 2021 level and the CPI is expected to grow by 0.4% compared to 2021. Hence, the analysed indicators suggest that the economic situation in Poland, USA and India will facilitate the transport industry development in the subsequent 5 years.

Our extensive study of the closeness of the connection between the transport and tourism industries in 2010 – 2018 showed that in Ukraine, the USA and India there is a close association in the form of the fourth-degree polynomial between tourism and domestic transport of passengers (for Ukraine $y = 1E\text{-}15x^4 - 1E\text{-}09x^3 + 0.0005x^2 – 85.635x + 6E+06$ at $R^2 = 0.9581$; for the USA $y = 1E\text{-}17x^4 - 3E\text{-}10x^3 + 0.0029x^2 – 12{,}029x + 2E+10$ at $R^2 = 0.9748$; for India $y = 1E\text{-}23x^4 - 7E\text{-}16x^3 + 2E\text{-}08x^2 – 0.1363x + 497{,}232$ at $R^2 = 0.9928$). In each of the aforementioned countries, the coefficient of determination is $R^2 > 0.9$. In Poland, the quartic polynomial between tourism and domestic transport of passengers is expressed by the

equation $y = -3E\text{-}14x^4 + 3E\text{-}08x^3 – 0.0116x^2 + 2{,}085.1x - 1E+08$ at $R^2 = 0.5387$, which indicates the absence of close link between the transport and tourism industries in this country. As a matter of fact, in China, there is no particular dependence between the aforesaid considered indicators.

Our study suggests that the United States and India have the best prospects for transport and tourism industries. In these countries rather than elsewhere, the carriers can count on the successful course of the international passenger traffic development. Notwithstanding the positive forecasts for the transport industry development in Poland, there is a rather weak link between the transport and tourism industries. Consequently, we cannot expect an active development of international passenger traffic here. Ukraine is surely deprived of such prospects due to the pessimistic forecast data on GDP per capita and domestic transport of passengers. In turn, China cannot count on the successful development of international passenger traffic due to the declining domestic passenger traffic and the lack of interdependence between tourism and domestic transport of passengers.

Needless to say that, given the COVID-19 pandemic, these relationships may be weakened for some time. Nevertheless, this is not the first time that the global economy has faced crises or recessions. Every time the world economy struggled and it was eventually able to overcome the crisis, even though it took years afterwards to re-establish previously identified interdependencies at a slightly different level. We believe that further research should focus precisely on this aspect.

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European Union policy for sustainable development – foundation, perspectives and results during the COVID-19 pandemic

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Abstract: The modern concept of sustainability as incorporated in the UN Agenda 2030 appears to be at the very heart of the EU endeavors under the auspices of the policy for sustainable development. However, the famous ten-year strategy Europe 2020 for a smart, sustainable and inclusive growth just ended and the launched drive for sustainable development seems to be overshadowed by the COVID-19 pandemic. Arguably, the COVID-19 pandemic can be seen as any other crises and thus implying threats as well as an opportunity to get down to true roots and values, and could ultimately lead to a more eager, just and fair sustainable development. Hence, it is instrumental to review the modern EU framework and setting, and to identify and assess key parameters of the EU policy for sustainable development. Consequently, appropriate EU strategies and their 24 initiatives are identified along with all 17 Sustainable Development Goals of the UN Agenda 2013 and, based on that, a holistic and heuristic Meta-Analysis is performed to assess (I) their foundations, including their ethical dimension, (II) current perspectives and (III) results based on indices. This is organically done in the recent contextual teleologism while using simplified Delphi scoring and Eurostat indices and while reflecting the impact of the COVID-19 pandemic. The result offers a set of valuable inputs leading to propositions that there is a lack of a common foundation, discrepancy in ethical dimension, manipulation in perspectives and, most importantly, a strong fragmentation and artificial tying of desired results, such as the Green Deal and COVID-19. The EU policy for sustainable development is at the crossroads and COVID-19 is an opportunity to become more consistent, legitimate, effective and efficient.

Key words: EU; policy; SDGs; sustainable development.

JEL: K32; M14; O29; 038; O44; Q01; Q56.

Introduction

Modern Western civilization is a complex society reflecting global competitiveness, digitalization and post-industrial features [Balcerzak & MacGregor Pelikánová, 2020; Lafferty 2019]. However, despite its fast evolution marked by a myriad of external determinants, it is strongly marked by its roots tracing back to ancient philosophy, to Christianity and to Roman law [MacGregor Pelikánová, 2017]. Therefore, each and every legal system of a jurisdiction belonging to modern Western civilization, regardless whether sharing the continental law or common law tradition, is in an ongoing manner marked by an ephemeral system of moral principles – ethics. Several kinds of ethics interact [Hooker, 1996; Law, 1999] and regional as well as national preferences for Bentham utilitarian or consequentialist ethics (good results), Kantian deontological ethics (good intentions), Aristotelian ethics (good sense of human life) with arithmetic and geometric perceptions of justice, can be observed. The biblical desire for

a just and ongoing growing prosperity vested in the concept of sustainability acquired a new dimension in 18th century Saxony, where Hans Carl von Carlowitz published his influential book, Sylvicultura Oeconomica, about *Nachhaltigkeit*. Consequently, individual responsibility became extended to long-term responsibility vis-à-vis the entire society, in particlular the environment and available resources in the forest and wood industry. The *Nachhaltigkeit* got *perpetuitas* dimension and the global and eternal responsibility based on the modern concept of sustainability fully developed in the 20th century [Schüz, 2012]. The United Nations ("UN") became the top international institution advancing that and the 1st milestone in this respect was the Universal Declaration of Human Rights ("UDHR"). In the 1960s, in a large part of the Western world, there emerged a reinforced interest in social progressive values, along with political awareness under the auspices of "communitarianism", and in the 1970s, this was transformed into an individualist focus marked by a set of world crises and a general move from Keynesian economic theory to neoliberal theory [Balcerzak & MacGregor Pelikánová, 2020]. This has shaped the modern concept of sustainability and put it on three pillars: environmental, social and economic, while underlying the dramatic need to reconcile available resources as an increasing world population emerged [Meadows et al., 1972; Zikic, 2018]. Again, the UN took the international leading initiative and issued the 2nd milestone - the Report of the World Commission on Environment and Development Report: Our Common Future, prepared by the Brundtland Commission, published as the UN Annex to document A/42/427 in 1987 ("Brundtland Report 1987") [MacGregor Pelikánová, 2019a]. Nevertheless, the most significant and recent international instrument regarding the concept of sustainability is defintely the 3rd milestone - the UN Resolution A/RES/71/1 from 2015 - Transforming our world: the 2030 Agenda for Sustainable development ("UN Agenda 2030"), which brought 17 Sustainable Development Goals ("SDGs") and 169 associated targets [MacGregor Pelikánová & MacGregor, 2020].

The UN Agenda 2030 is based on the five Ps and is an aspirational plan of action for people, planet, prosperity, peace, and partnership. It is an international law instrument with rather declaratory than mandatory features, with a global nature and ultimately a performance framework arguably difficult to be cascaded to the sub-national and individual business levels [Patel et al. 2017, Galli et al. 2018]. To put it differently, although the UN Agenda 2030 binds only signatory states and is not empovered by a strong enforceable mechanism, the concept of sustainability and SDGs are illusory and futile [Bali & Fan, 2019]

without a universal committment at all levels – regional, national, local and even individual. An appropriate, and probably the only feasible, model for that is a multi-stakeholder model [Van Tulder, 2017] and cross-sector partnership [Van Tulder et al., 2016]. Consequently, the concept of sustainability with its SDGs needs effective and efficient support by all, and within the context of the EU, the first one is the EU itself with all its policy for sustainable development and for the commitment of businesses via their Corporate Social Responsibility ("CSR") [Balcerzak & MacGregor Pelikánová, 2020; MacGregor Pelikánová, 2018]. Nevertheless, there are voices that the EU with its policies is not doing enough and that Europeans fail in making adequate provisions oriented towards SDGs [Adshead et al. 2019, Thacker et al. 2019]. There are even propositions that the concept of sustainability with SDGs is merely unrealistic and that the EU policy for sustainable development is a just a declaration without any legal liability [Sroka & Lőrinczy, 2015], detached from the pragmatic and often strong materialistic profit-increasing orientation of EU member states and Europeans [MacGregor et al. 2020a & 2020b]. In addition, the COVID-19 pandemic arguably makes this even worse and ultimately the commitment to go for SDGs is falling behind, especially at the local and individual levels [Mansell et al. 2020; Metzker & Streimikis 2020]. Hence, let us identify and assess the European Union policy for sustainable development, and in particular its (I) foundation and (II) perspectives during the COVID-19 pandemic as well as (III) results based on indices. Organically, this can be achieved, firstly, by dealing with the current EU context and listing all key instruments, secondly, setting an appropriate methodology and, thirdly, going over the results, while paying particular attention to (I) foundations, including their ethical dimensions and (II) current perspectives and (III) results based on indices.

Theoretical premises – key EU legislation and strategies for sustainable development

The EU has relatively closely followed the described international law endeavors under the auspices of the UN and embarked on a journey in the name of sustainability, in particular of sustainable development, just at the turn of the millennium. The starting point was the Treaty of Amsterdam, which was signed in 1997 and entered into force in 1999 ("Treaty of Amsterdam"), and significantly amended the Maastricht Treaty on EU ("TEU"). Indeed, the Treaty of Amsterdam is a primary source of the EU law, which brought substantial changes

and, together with the Treaty of Nice from 2001/2003, built the way to the reformative Treaty of Lisbon from 2007/2009. In particular, the Treaty of Amsterdam replaced the existing 7th recital of the TEU with the the following: ”*Determined to promote economic and social progress for their peoples, taking into account the principle of sustainable development and within the context of the accomplishment of the internal market and of reinforced cohesion and environmental protection, and to implement policies ensuring that advances in economic integration are accompanied by parallel progress in other fields*.” To avoid any misunderstandings, it included as one of the top objectives of the EU “*to promote economic and social progress and a high level of employment and to achieve balanced and sustainable development, in particular through the creation of an area without internal frontiers, through the strengthening of economic and social cohesion …*”.

The consolidated version of the TEU, i.e. after the reform by the Treaty of Lisbon, states in Art.3 para 3 “*The Union shall establish an internal market. It shall work for the sustainable development of Europe based on balanced economic growth and price stability, ahighly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. It shall promote scientific and technological advance.”* Indeed, the entire EU constitutional trio of primary sources, i.e. TEU, TFEU and Charters, is notorious with its drive to underline the social and environment dimensions [Polcyn et al., 2019].

The command of the sustainable development became projected from the primary sources of the EU law into secondary sources of the EU law, such as Regulations and Directives, as well as in EU strategies, such as the Communication A sustainable Europe for a better world: A European strategy for Sustainable Development – COM (2001) 264 final (“EU Sustainable Development Strategy”), the Communiction Europe 2020 A strategy for smart, sustainable and inclusive growth – COM (2010) 2020 (“Europe 2020 Strategy”) and the EU's Better Regulation Agenda [EC, 2021a]. It got projected even in sectoral policies such as the 7th Environment Action Programme. In addition, the EU has engaged in other activities and endeavors aimed at inspiring and inducing EU member states and ultimately all Europeans towards the concept of sustainability and sustainable development, while fully recognizing the effectiveness and efficiency of the multi-stakeholder model.

The EU has been very consistent regarding the UN Agenda 2030 and its 17 SDGs; indeed, the EU can be perceived as at least their indirect co-author. Further, in 2016, the EU

put out a press release regarding a sustainable development package – Sustainable Development: EU sets out its priorities. Consquently, the EU progesses via two tracks. Firstly, the European Commission commits to mainstreaming the SDG into EU (general or already established) policies and initiatives with all stakeholders while employing a multi-stakeholder Platform. Secondly, the EU launches reflection work on developing further longer-term vision and the focus of sectoral policies after 2020, and reorients the EU budget's contributions towards the achievement of the EU's long-term objectives through the new Multiannual Financial Framework beyond 2020 [EC, 2021b].

The new European Commission, under the presidency of Ursula von der Leyen, has repeatedly emphasized its commitment to the UN Agenda 2030 and has presented an ambitious policy programme to deliver on sustainability in the EU and beyond, across all sectors under the auspices of the European Commission ´s holistic approach for sustainability and the SDGs leading to 24 initiatives [EC, 2021c]. Hence, it is highly relevant to indentify and assess these initiatives and the ultimate meeting of SDGs via Eurostat indicators [EC, 2021d], i.e. (I) their foundations, including their ethical dimensions, (II) current perspectives and (III) results based on indices. This has to be done in the current setting which is strongly marked by the COVID-19 pandemic [Goniewicz et al., 2020].

Indeed, the discussion regarding the concept of sustainability, sustainable developemt and value judgements about justice in the distribution and use of resources [Marinova&Raven, 2006] and the meeting of 17 SDGs has been dramatically impacted by the COVID-19 pandemic [Ashford et al, 2020]. Arguably, the slow progress towards these 17 SDGs was magnified by the COVID-19 pandemic [Balcerzak & MacGregor Pelikánová, 2020] and consequently their satisfaction in 2030 is becoming more and more questionable [Filho et al., 2020]. COVID-19 is a disease caused by a version of the coronavirus that appeared in 2019 and was named SARS Covid 2 [Manojkrishnan & Aravind, 2020]. The coronavirus gets its name due its outer peripheral, crown-like, embedded envelope protein, whicharguably emerged around 2002 in human beings [Rasool & Fielding, 2010] and its version called MERS in 2012 [Manojkrishnan & Aravind, 2020]. Pursuant to the data presented by the International Monetary Fund and the World Bank in August 2020, it has brought a global economic downturn that had not been experienced in at least seven decades, namely the global economy shrunk by 5.2% in 2020 [WB, 2020]. It is proposed that the dynamics of the 1st and 2nd waves, especially in the EU, are worrisome [Kufel, 2020] and it is questionable if the EU manages to perceive, at least

partially, COVID-19 as an opportunity [Goniewicz et al., 2020], and this despite strong and heavily positive statements by the President of the European Commission, Ursula von derLeyen [EC, 2020].

Methodology

The modern concept of sustainability as incorporated in the UN Agenda 2030 appears to be at the very heart of the EU endeavors under the auspices of the policy for sustainable development. However, the famous ten-year strategy, Europe 2020 for a smart, sustainable and inclusive growth, has just ended and the launched drive for sustainable development seems to be overshadowed by the COVID-19 pandemic. A critical review of the modern EU framework and setting reveals a triad of top EU sustainable development strategies, which are inspired by the UN Agenda 2030: EU Sustainable Development Strategy, Europe 2020 Strategy and EU's Better Regulation Agenda [EC, 2021a]. They are destilled into 24 initiatives which, together with 17 SDGs, should be coming close to both completion and satisfaction.

Thus, a holistic and heuristic Meta-Analysis is performed to assess (I) their foundations, including their ethical dimensions, (II) current perspectives and (III) results based on indices. The employment of Meta-Analysis is highly relevant, because it is the technique par excellence for such a study [Silverman, 2013], founded upon the conviction that more information is available than conventionally admitted and realized [Schmidt & Hunter, 2014], especially considering the scientific model of both direct and indirect causality [Heckman, 2005]. The measuring parameters are dual: simplified Delphi method scoring by a panel of three experts with two adjustment rounds [MacGregor Pelikánová, 2019a] regarding 24 initiatives and Eurostat indices regarding SDGs. The interpretation of data is dominated by a descriptive analysis, while using a combination of text analysis, also known as content analysis [Kuckartz, 2014], which makes replicable and valid inferences about texts and is considered an established research method. The teleological approach and the contextual factors, such as COVID-19, are reflected and the Socratic questionnning method is employed.

Results

The EU policy for sustainable development has recently culminated in the following 24 iniatives [EC, 2021c], which have different (I) foundations, (II) perspectives and (III) results

based on indices. Therefore, a simplified Delphi method scoring by a panel of three experts was performed and the results are summarized in Table 1.

Table 1. The overview of 24 iniatives with respect to the EU policy for sustainable development and their foundations andperspecties

	Foundation pillar	**Ethical dimension**	**Perspective**
Communication on a European Green Deal: a new growth strategy to transform the EU... no net emissions of greenhouse gases in 2050.	Environment – Green Deal	Consequential ethics	Long term actionable
Communication on the Annual Sustainable Growth Strategy 2020 ... in integrating the SDGs.	Social	Deontological ethics	Declaratory
Communication on the Green Deal Investment Plan: the EU strategy to boost sustainable public-private financing over the next decade.	Environment – Green Deal	Consequential ethics	Long term actionable
Proposal establishing Just Transition Fund.	Environment – Green Deal Finance	Aristotelian ethics – justice	Bureacratic
Communication on a Strong Social Europe for Just Transitions.	Social	Deontological ethics	Declaratory
Communication on Shaping Europe's Digital Future.	Economic	Aristotelian ethics - sense	Visionary, declaratory
Proposal to put into law the objective to make the EU climate neutral by 2050.	Environment – Green Deal	Consequential ethics	Long term declaratory
Coordination of a common European response to the COVID-19 outbreak to tackle the health crisis and cushion the impact of this economic hit and ERA vs CORONA.	Social and Economic – Solidarity, Finance	Deontological ethics	Short term declaratory
Communication on a Union of Equality: Gender Equality Strategy 2020-2025.	Social and Economic	Consequential ethics	Short term declaratory
Communication on a New Industrial Strategy for Europe.	Economic	Deontological ethics	Declaratory
A new Circular Economy Action Plan for a cleaner and more competitive Europe.	Economic	Consequential ethics	Declaratory
Communication on an EU Biodiversity Strategy for 2030.	Environment – Green Deal	Consequential ethics	Mid-term declaratory commitment
Communication on a Farm to Fork Strategy for a fair, healthy and environmentally friendly food system.	Environment – Green Deal	Deontological ethics	Part of Green Deal

Joint Communication and the EU Action Plan on Human Rights and Democracy for 2020-2024.	Social	Aristotelian ethics - sense	Short-term declaratory
Agenda for sustainable competitiveness and social fairness and resilience.	NA	NA	NA
Package for fair and simple taxation including Communication on an Action Plan for fair and simple taxation supporting the recovery and Communication on Tax Good Governance in the EU and beyond.	Social and Economic – Finance	Deontological ethics	Shortterm declaratory
Communication on stepping up Europe's 2030 climate ambition: Investing in a climate-neutral future for the benefit of our people.	Environment	Consequential ethic	Declaratory
The New Pact on Migration and Asylum and accompanying legislative proposals and recommendations.	Social	Deontological ethics	Declaratory
Communication on Achieving the European Education Area by 2025.	NA	NA	NA
Communication on a new European Research Area.	Economic	Consequential ethics	Short-term action
Proposal establishing the 8th Environment Action Programme.	Environment – Green Deal	Consequential ethics	Part of Green Deal
Communication on a Renovation Wave.	Environment	Deontological ethics	Declaratory
Communication on a Chemicals Strategy for sustainability.	Environment – Green Deal	Deontological ethics	Declaratory
Proposal for a Directive on adequate minimum wages in the European Union.	Social	Deontological ethics	Declaratory

Source: Own study based on EU information [EC, 2021c]

A cursory overview already reveals that there are two common points of these 24 iniatives – Green Deal and COVID-19. Therefore, these 24 iniatives share different foundations and ethical dimensions, as well as actionability v. declaratory dynamics, and their unifying points are the repeatedly and consistenly advanced Green Deal along with COVID-19. This is highly surprising because, conventionally, each pivotal strategy should have a foundation and ethical dimenstion, both of which are projected in its sub-policies and thus the coherency is reinforced [MacGregor Pelikánová & MacGregor, 2021]. It appears that these 24 initiatives are rather an ad hoc reaction than a planned organized action with the same roots.

Moving to the common points, it is impressive that the Green Deal is present directly in 33% of initiatives (8 out 24) and indirectly almost in 50% of initiatives, while COVID-19 is present directly in 25% of initiatives (6 out 24). Occasionally, these two points overlap, i.e. both are present in the same initiative.

The list of 6 iniatives dealing with COVID-19 includes:

- Coordination of a common European response to the COVID-19 outbreak to tackle the health crisis and cushion the impact of this economic hit and ERA vs CORONA;
- Communication on an EU Biodiversity Strategy for 2030;
- Package for fair and simple taxation, including Communication on an Action Plan for fair and simple taxation supporting the recovery and Communication on Tax Good Governance in the EU and beyond;
- Communication on stepping up Europe's 2030 climate ambition: Investing in a climate-neutral future for the benefit of our people;
- Communication on a new European Research Area;
- Communication on a Renovation Wave.

This leads to a burning question – how synergetically can the Green Deal and COVID-19 overlap and interact? In particular, are Green Deal measures helpful in fighting against COVID-19 and are measures against COVID-19 supporting the Green Deal? The rethoric from the European Commission attempts to overlap with a synergetic interaction, but a mere field observation of what is going in the EU argues against it, see e.g. the use of plastic and disinfection, invidual packaging, etc. Ultimately, it seems that there is fragmentation and contradiction not only in foundations and ethical dimensions, but also in perspectives and results. Plainly, R&D is instrumental in the COVID-19 battle as well as for the Green Deal, but only this one true common denominator represents the SDG, which is perhaps the most underplayed by the EU [MacGregor Pelikánová, 2019b]. This is extremely worrisome – in the time of the Green Deal and COVID-19, the EU is still dramatically behind SDG9 and the ratio R&D v. GDP is definitely not getting close to the target of 3%. And what about other SDGs?

The EU policy for sustainable development has been closely tied to 17 SDGs, at least pursuant to the very strong wording of the European Commission [MacGregor Pelikánová et al., 2021]. Therefore, it is highly relevant to have an overview about how these SDGs, based

on indices selected by the EU, are met, i.e what progress was made between 2010 and 2018 [EC, 2021d]. Thusly, Eurostat information about these indices is extracted and summarized in Table 2.

Table 2. The overview of SDGs progress in the EU between 2010 and 2018

SDG	**Indice**	**2010**	**2018**
SDG1: No Poverty	% at risk of poverty	23.9%	21.6%
SDG2: Zero Hunger	Agricultural factor	80	120
SDG3: Good Health and Well-being	Life expectancy	76/83	78/84
SDG4: Quality Education	Early leavers	14%	10%
SDG5: Gender Equality	Gender pay gap	16%	14%
SDG6: Clean Water and Sanitation	People living without sanitary facilities	3%	2%
SDG7: Affordable and Clean Energy Action	Primary energy consumption	97%	92%
SDG8: Decent Work and Economic Growth	GDP per capita	EUR 24 900	EUR 27 610
SDG9: Industry, Innovation and Infrastructure	GDP v. R&D	1.97%	2.18%
SDG10: Reducing Inequality	Disparities in GDP per capita	EUR 24 900	EUR 30 200
SDG 11: Sustainable Cities and Communities	Overcrowing rate	19%	17%
SDG 12: Responsible Consumption and Production	Resource productivity and domestic material consumption	1.7	1.9
SDG13: Climate Action	Greenhouse gas emissions	87.3	79.3
SDG 14: Life Below Water	Surface of marine sites	150k	450k
SDG15: Life on Land, (16) Peace, Justice	Surface of terrestrial sites	760k	764k
SDG16: Peace, Justice, and Strong Institutions	Death rate due to homicide	1/100 000	0.69/100 000
SDG17: Partnerships for the Goals	Official development assistance	0.41	0.43

Source: Own study based on EU information [EC, 2021d]

Manifestly, certain indices look extremely promising (SDG2, SDG4, SDG13, etc.), while others appear far behind expectations (SDG5, SDG9, SDG 17, etc.). In addition, the nature and foundation of certain indices are highly questionable (SDG 14, SDG15, SDG16, etc.).

However, even more importantly, questions emerge whether the 24 EU initiatives and the entire EU policy for sustainable development are so tightly linked to SDGs as advanced by the EU, especially the Europan Commission. The total fragmentation and lack of common foundations and ethical dimensions, the chronically underfinanced R&D and overplayed Green Deal concerns lead to contradictions [MacGregor Pelikánová et al., 2021]. Additionally, it can be argued that these contradictions became obvious during the crisis' occurrence – COVID-19 [MacGregor Pelikánová&Hála, 2021; D´Adamo & Lupi, 2021]. The EU and EU businesses fell far behind and the R&D in other parts of the world, benefiting by much stronger private and public support, led to results desperately needed by the EU, see the Pfizer, AstraZeneca and Oxford vaccines. Even worse, the re-distribution and re-sharing across the EU leads to many questions about the true European solidarity. Ultimately, actions speak louderthan words and even the most developed rhetoric of the European Commission cannot hide the fact that the EU policy for sustainable development is both fragmented and at the crossroads.

Summary, recommendations

The modern EU framework and setting are complex and the EU policy for sustainable development appears, despite (or due to?) the plethora of rethoric of the European Commission, very puzzling. Hihgly ambitiously, the EU engaged in three large strategies and their 24 initiatives, which should ultimately lead to the meeting of all 17 Sustainaible Development Goals of the UN Agenda 2013.

However, a holistic and heuristic Meta-Analysis reveals differences in the foundations and in their ethical dimensions. The perspectives are not consistent, the entire setting appears fragmented and only two desired results, the Green Deal and battling COVID-19, appear to be the unifying elements. Nevertheless, organically and with respect to contextual teleologism, the simplified Delphi scoring and Eurostat indices about SDGs, even more discrepancies emerge and ultimately the COVID-19 pandemic assists in showing that the EU policy for sustainable development has serious conceptual flaws. Also, that it unrealistically wants

to reconcile hardly reconciliable (COVID-19 and Green Deal) projects while underplaying the winning ticket for both of them (SDG9 - R&D). It is time to become pragmatic and realistic. Without a common foundation, with a discrepancy in the ethical dimension and manipulation in perspectives, a solid policy can hardly be built. Moreover, it is even more illusory to want to overcome a strong fragmentation by artificially tying the desired results together, such as the Green Deal and COVID-19. The EU policy for sustainable development is at the crossroads and COVID-19 is an opportunity to become more consistent, legitimate, effective and efficient. The first step in this direction should be stopping the issuing of dozens of iniatives and communications, and instead to set a clear and commonly acceptable foundation,be realistic and honest. The EU is at least indirectly a co-author of the UN Agenda 2030 and its 17 SDGs, so it needs to take a more serious approach, at least about SDGs, which are critical for the Green Deal and COVID-19.

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Implementation of the Concept of Circular Economy in Ukraine

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Abstract: The concept of circular economy of Ukraine's processing industry on the basis of combination of modern practical experience and economic and mathematical methods and models is developed in the work. The concept includes many stages aimed at stabilizing Ukraine's processing industry in the conditions of transformational changes. Each stage requires appropriate information support, statistical and economic methods of information processing. The decision-making process is based on a scenario approach to modeling, using a modern economic and mathematical apparatus. The relationship between the stages is realized through a system of direct links and feedback, which determine the sequence of management actions. A method of generalizing the index of ecological and economic development has been developed to compare the pace of sectoral development and the amount of damage caused to the environment.

Sustainable economic growth in the long run must be ensured by intensive development factors. That is why it is proposed to compare the sectoral index of environmental load with the corresponding index of economic development. In turn, the latter should indicate not only the physical volume of total production at comparable prices, but also reflect the qualitative nature of changes that have occurred during sectoral development, and were associated with a reduction in the share of intermediate consumption. The generalized index of sectoral ecological and economic development thus received will show efficiency of introduction of principles of circular economy in the operation of processing industry companies during the reporting period, and also due to the proposed actions. The economic substantiation of a complex of measures on recycling of the processing sector of Ukraine aimed at maintaining sustainable development is carried out.

During 2016-2018, the processing industry created favorable conditions for moderate economic growth, which was accompanied by a reduction in pollution of all kinds. A positive result was achieved due to metallurgical production and mechanical engineering. Since the development and implementation of closed-loop technologies in production activities requires significant investment resources, the recommendations in this case are to maintain existing trends by intensifying environmental measures and further implementing them.

It was found that the implementation of measures to minimize the generation of waste within the processing industry only will not be able to radically solve the problem of its generation and accumulation. The solution can only be a comprehensive modernization of the entire economy, in particular, the extractive industry;

In the structure of waste use, the largest share, exceeding 70%, was occupied by waste disposal in specially designated areas, and only about 30% accounted for utilization. This situation has developed primarily due to the extraction of iron ore. Areas of possible use of this type of waste are: further processing and extraction of residual minerals at ferrous metallurgy enterprises as building materials of the construction industry. However, given the use of outdated technologies, further processing is not economically feasible. Therefore, in the long run, Ukraine's industry should reorient from the extraction and primary processing of resources to the production of high-tech products with a high share of added value.

Keywords: circular economy, sustainable development, closed ecological and economic cycle, economic and mathematical methods and models

JEL: O1, O2, O3, O4

Introduction

Based on the world experience of the introduction of the circular economy as a form of organization of social production, which involves the reuse of waste from economic activities and households [1-5], as well as products whose life cycle is nearing completion as resources, we have proposed the concept of development of the ecological and economic cycle of Ukraine's. processing industry. Sustainable socio-economic development based on a linear model of the economy has obvious advantages in improving the welfare of the population. But in the long run, it has significant shortcomings that threaten the energy, environmental and economic security of the state. The negative consequences of a linear economy are manifested in the form of: uncontrolled use of natural resources, which over time leads to their depletion, deficit and rising prices; environmental pollution due to atmospheric emissions, including carbon dioxide, use of fresh water, deforestation, as well as fertilizer and pesticide application; accumulation of waste, landfills, which now occupy about 7% of the total territory of Ukraine; etc.

In contrast, the circular economy, or closed-loop economy, is considered by modern scientists as part of the fourth industrial revolution. It is based on the principle of recycling of any product, resulting in minimization of waste from economic activities, a significant reduction in consumption of natural resources, as well as the transition to renewable resources.

The urgency of implementing the principles of the circular economy in the activities of enterprises in the processing industry of Ukraine is primarily due to significant consumption

of natural resources and damage to the environment as a result of air emissions and large amounts of waste.

Research on this topic is just beginning to gain momentum, but contributions to the problems and prospects of the circular economy have been made by such foreign and Ukrainian scientists as Chen Demin, W. Stachel, N. Boken and E. Olivetti, P. J. Matthews, K. Fletcher, O. Ulanova, S. Miroshnichenko and others. Members of the Club of Rome - E. Weizsäcker, A. Wijkman, D. Meadows and A. Peccei – all of whom made a significant contribution to the development of ecologically oriented activities. Among Ukrainian researchers, attention was paid to this issue in the works of: N. Gakhovych, L. Deineko, O. Dronova, I. Zvarych, A. Zygun, O. Maleya, V. Mishchenko, L. Sergienko-Berdyukova, I. Tymoshenko and others.

Theoretical premises

The developed concept consists of many stages aimed at stabilizing the processing industry of Ukraine in the conditions of transformational changes. Each stage requires appropriate information support and statistical and economic methods of information processing. The decision-making process is based on a scenario approach to modeling, using a modern economic and mathematical apparatus. "The relationship between the stages is realized through a system of direct links and feedback, which determine the sequence of management actions" [6]. Thus, the concept implements the principles of modern approaches to management in the economy, namely:

- the process approach is based on the need for continuous management, whose sequence is determined by the stages of the concept and the set of direct links between them;
- a system-based approach considers the processing industry as an open system that interacts with other sectors of the economy and consumers of final products. Resources are fed to the input of this system; at the output we get the total products and the corresponding level of environmental pollution. One part of the generated waste is fed through feedback to the input of the system as resources for reuse, and the other - accumulates in the places of their disposal;

- a situational approach is based on the need for constant analysis of the current situation to develop and make adequate decisions, and is implemented in the form of feedback between the stages of the concept.

Detailing of the stages of the concept was performed according to the functional purpose. We propose to consider them in more detail.

Stage 1. Collection of input statistics. Input data is collected in statistics areas of key macroeconomic indicators, such as: inflation rate, gross domestic product, total output, etc.;

- volumes of environmental pollution by atmospheric emissions, use of water resources and waste generation by types of economic activity;
- waste management statistics by region;
- "costs-output" statistical tables;
- volumes of current expenses and capital investments for environmental protection.

The obtained input data and the results of their initial processing are transferred to the next stage of the concept.

Stage 2. Defining a set of indicators to assess the sectoral level of environmental load.

As mentioned above, the amount of environmental pollution in statistical practice is measured by such indicators as: use of fertilizers and pesticides, forest resources, air pollution, collection and use of water resources, waste generation and management, etc. The first two groups of indicators are directly related to agriculture, forestry and fisheries, so they were not included in the concept of development of the ecological and economic cycle of the processing industry of Ukraine.

Regarding the conceptual apparatus, the environmental load will be understood as the amount of damage caused to the environment from all types of pollution during a certain period, in relation to the region.

Stage 3. Analysis of trends in environmental and economic development in the processing industry.

Any management should be based on the results of a preliminary analysis of the current situation and current trends in the dynamics of the studied indicators [7-10]. That is why this stage of the concept is mandatory and is part of the feedback loop.

The methodological support of this stage of the analysis is the model of the index of sectoral ecological and economic development, created by the author. It is based on the

premise that the current dynamics of environmental load can not indicate the effectiveness of changes in the circular economy, as the reduction of environmental pollution may be associated with an even greater reduction in total production and vice versa. That is why it is proposed to compare the sectoral index of environmental load with the corresponding index of economic development. In turn, the latter should indicate not only the physical volume of total production at comparable prices, but also reflect the qualitative nature of changes that have occurred during sectoral development, and were associated with a reduction in the share of intermediate consumption.

The generalized index of sectoral ecological and economic development thus received will show efficiency of introduction of principles of circular economy in the activity of enterprises of the processing industry during the reporting period, and also due to the suggested actions.

Stage 4. Effective waste management in the industry. To analyze the effectiveness of waste management, taking into account the criteria of the circular economy, the paper proposes to use a system of indicators that allow a comprehensive assessment of interrelated activities for:

1) Prevention of waste generation. The priority of this measure is due to the fact that the absolute minimization of waste eliminates the need for all subsequent stages of their management.
2) Waste management structure management. It is known from [11] that “the current European waste management standards are based on the following hierarchy of priorities: - preparation of waste for reuse; - processing and utilization; - other types of utilization, such as energy recovery by incineration; - waste disposal by confining it to specially designated areas. "In contrast, domestic statistical practice keeps records of waste use in such areas of assessment as" [12]: - utilization; - incineration; - waste disposal in specially designated places; - placement of waste in landfills. Therefore, considering the concept of ecological and economic development of the country, or the relevant industry on the basis of a circular economy, this hierarchy of priorities should form its basis. It should also be borne in mind that open statistics contain information on waste management by region, not by type of economic activity.

3) Minimization of volumes and concentration of accumulated waste. Large amounts of accumulated waste today pose a threat to the environmental situation of some regions in Ukraine. That is why this direction of assessment is an important element of effective management.

Stage 5. Development of scenarios for environmental management of industrial products. The results of the previous two stages are the basis for the development of scenarios for the management of environment-friendly production in the processing industry. By environmental friendliness, in this case, we mean prevention of the total damage to the environment caused as a result of all stages of production, to final consumption. It is obvious that the volume of environmental pollution only by the processing industry can not be a criterion for the environmental friendliness of its products, as this is only one of the intermediate or final stages of its production. Due to the close cross-sectoral links, the final product goes through many stages of processing by various industries, which have a negative impact on the environment. Thus, if the products obtained are non-environmentally friendly, the problem may lie not only in the processing industry, but also in other suppliers of raw materials, in particular, the mining industry. In this case, processing companies can change existing counterparties to those whose social and environmental responsibility of the business is at a higher level, which is also due to the expansion of foreign trade relations. This will increase the environmental friendliness of production by changing the structure of intersectoral relations only.

"The methodological basis of these calculations is the Leontief inter-industry balance model " [13-14], which uses aggregate statistical "Costs-output" tables as input data. With its help we are able to assess the current state and develop scenarios for managing the environmental friendliness of production in the following main areas:

- calculation of the amount of total damage to the environment that was caused during the production in a particular sector of the economy, taking into account all stages of value-added production;
- analysis of the anthropogenic impact of all industries involved in the production of final products of the processing industry;
- scenario analysis of the effect of the spread of the forecast final demand on the environmental friendliness of production, etc.

Stage 6. Economic assessment of the consequences of sectoral development in the transition to a circular economy.

"All the above measures to implement the principles of the circular economy need their economic evaluation" [15]. In some cases, they are new resource-intensive technologies with a long payback period, which require the use of financial mathematics and evaluation of the effectiveness of investment projects. In other cases, this problem can be solved on the basis of multi-criteria evaluation of the results of scenario modeling, which was carried out at the previous stage.

Methodology

Next, we consider in more detail the methodological support of the stages of the proposed concept. The problem of quantitative measurement of the index of ecological and economic development in the processing industry is to be assessed in this study on the basis of geometric means, as the analysis of trends in its components is based on relative indicators of dynamics.

The sectoral index of economic development includes two factors: the sectoral average annual GDP growth rate and their relation to the growth rate of total output. Both indicators should be maximized, which indicates quantitative and qualitative positive changes.

(1) $$IEP = \sqrt{T_{GDP} \times T_{GDP/CB}}$$

where *IEP* is a sectoral index of economic development; T_{GDP} is an average annual growth rate of sectoral GDP;

$T_{ВВП/СВ}$ – the ratio of the growth rate of sectoral GDP to the growth rate of total output.

Formula (1) applies if both factors have the same weight. If experts give greater preference to one of the factors, then the formula will look like a geometric weighted average.

(2) $$\bar{x} = \sum_{a_i} \sqrt{\prod_{i=1}^{n} \left(x_i^{a_i} \right)}$$

where $\bar{x}$ is a geometric weighted average x_i – the average annual growth rate of the i factor;

a_i – weighting factor of the i factor; n is the number of multiplier factors.

Considering that $\sum_{i=1}^{n} a_i = 1$ and taking into account the entered symbols, formula (1) takes the form:

(3) $$IEP = T_{GDP}^{a_1} \times T_{GDP/CB}^{a_2}$$

We get the greatest positive effect when the industry not only increases value added, but also reduces the share of intermediate consumption, which indicates an increase in the efficiency of its activities.

The sectoral index of environmental load is formed on the basis of the growth rate of environmental pollution in all areas of assessment.

(4) $$IEH = \sqrt[n]{\prod_{i=1}^{n} T_{E_i}} \quad \text{or} \quad IEH = \prod_{i=1}^{n} \left(T_{E_i}^{a_i}\right)$$

where *IEH* is the industry index of environmental load;

T_{E_i} is the average annual growth rate of pollution in the j direction of assessment, per 1 thousand km2 area;

n – number of types of pollution.

By analogy, the first interpretation of formula (4) assumes the same weight for each type of pollution; the second - different weights, in accordance with the system of preferences of the expert.

The direction of optimization of each is minimization. It means that the average annual volume of the *i* type of pollution in absolute terms tended to decrease and vice versa. Accordingly, the IES performance indicator should also be minimized.

Then, the generalized index of sectoral ecological and economic development, within the transition of the processing industry to a closed-cycle economy, will be calculated by the formula:

(5) $$I_{\Gamma} = \frac{IEP}{IEH}$$

where I_{Γ} is the generalizing index of branch ecological and economic development

Given the direction of optimization of the numerator and denominator, this generalized IG index should be maximized.

Thus, the proposed model of the sectoral index of ecological and economic development, in contrast to the existing ones, allows to conduct a quantitative analysis of the

results concerning the formation of a closed ecological and economic cycle of Ukraine's processing industry and develop recommendations for its activation.

The quality of waste management by region is determined by the structure of its use. Preference is given to recycling, whose share should be maximized relative to other uses. The next priority is the incineration of waste to generate electricity or heat. It is undesirable, according to the criteria of circular economy, to remove waste to specially designated areas. It is also practiced in Ukraine to dispose of waste in landfills, the share of which should be reduced to zero. Thus, effective waste management involves the presence of structural changes that lead to a redistribution of their share in favor of priority uses and vice versa.

Below, we consider the model for estimating structural changes in waste dynamics. To do this, we introduce conventional symbols. Let us presume that:

- volumes of waste generation by regions are given by vector $YB[n]$, where *n* is the number of regions of Ukraine; YB_i - volumes of waste generation in the *i* region as a result of economic activity and household waste production.
- volumes of waste use by region are indicated by matrix, where *m* is the number of areas of waste use for which statistical accounting is conducted (utilization, incineration, disposal in specially designated places, placement in landfills), *m = 4*; BB_{ij} - the amount of waste used in the *j* direction in the *i* region. Then, $YB_i = \sum_{j=1}^{m} BB_{ij}$ is the volume of waste generation in the *i* region is equal to the total volume of its use in all regions.
- volumes of accumulated waste by region are given by vector $HB[n]$, where *HBi* are volumes of accumulated waste in the *i* region in specially designated places and in natural landfills.

The last of the considered indicators is connected with the previous discrete dynamic equation, which has the following form:

$$HB_i(t) = HB_i(t-1) + BB_{i3}(t) + BB_{i4}(t) \quad (5)$$

where $HB_i(t)$ and $HB_i(t-1)$ are the volumes of accumulated waste in the *i* region, in the reporting and previous periods, respectively;

$BB_{i3}(t)$, and $BB_{i4}(t)$ are, accordingly, the volumes of waste in the *i* region, disposed during the reporting period in specially designated places and placed in landfills.

To assess the structural changes in the use of waste, based on the introduced conventional symbols, the appropriate shares are calculated:

(6) $$BB_{SB,ij} = \frac{BB_{ij}}{YB_i} \quad \text{for all} \quad i = 1\ldots n,\ j = 1\ldots m,$$

where $BB_{SB,ij}$ is the share of the *j* direction of waste use in the total amount of its generation in the *i* region.

It should be noted that $\sum_{j=1}^{m} BB_{SB,ij} = 1$ for all $i = 1\ldots n$.

In statistical practice, indicators of absolute growth and particle growth rate are used to analyze structural shifts. Estimation of intensity of structural shifts occurs on the basis of linear or quadratic coefficients of variation.

Regarding the use of waste, the effective implementation of the circular economy principles should ensure the redistribution of specific weight:

- $BB_{SB,i4}$ in favor of $BB_{SB,i3}$, $BB_{SB,i2}$ and $BB_{SB,i1}$;
- $BB_{SB,i3}$ in favor of $BB_{SB,i2}$ and $BB_{SB,i1}$;
- $BB_{SB,i2}$ in favor of $BB_{SB,i1}$.

The ultimate goal of the desired changes is the disposal of all generated waste by region, ie $BB_{SB,i1} = 1$ for each i region = 1… n.

The disadvantage of traditional indicators of the intensity of structural changes used in general statistics is only a quantitative assessment of the relative magnitude, rather than the direction of changes in waste management. However, as we have seen, it is the direction of structural changes that determines the effectiveness of measures to form a closed ecological and economic cycle. That is why it was suggested in the paper to use additive-multiplicative convolution, which, taking into account the entered notations, has the following form:

(7) $$C_{BB,i} = \sum_{j=1}^{m} \left(\alpha_j \times BB_{SB,ij}\right), \qquad CC_{BB,i} = \sum_{j=1}^{m} \left(\alpha_j \times \Delta BB_{SB,ij}\right), \quad \text{for all i} = 1\ldots n,$$

where $C_{BB,i}$ and $CC_{BB,i}$ are, accordingly, summarized indicators of the structure and structural changes of waste use in the *i* region.

α_j – weighting factor that determines the priority of the *j* direction of waste use;

$\Delta BB_{SB,ij}$ – change in the share of the *j* direction of waste use in the *i* region in the reporting period, compared to the baseline.

"When conducting multifactor analysis, in economic and mathematical analysis, a common practice is the use of additive-multiplicative convolutions to determine the generalized indicators" [16-18]. "In this case, the input factors are normalized for the segment" [0; 1] to ensure the comparability of their values.

The weights of the factors are positive, and their sum should be equal to 1. The values of the weights are different methods of expert evaluation and coordination of opinions. "As a result of such a convolution, the generalized indicator also takes values from 0 to 1 and should be maximized" [19].

Regarding the indicator of the structure of waste use, formula (7), it significantly differs from the above methodology:

- as input factors of this convolution indicators of specific gravity are used, which can take values from 0 to 1, but their sum will always be equal to 1;
- to ensure the condition of $C_{BB,i}$ belonging to the segment [0; 1], the weights must also be within $0 \le \alpha_j \le 1$, but at least one value must be equal to $\alpha_j = 1$

Thus, the standard decision-making methods for determining the system of α_j preferences cannot be applied in this case, as the requirements for weights differ from traditional ones.

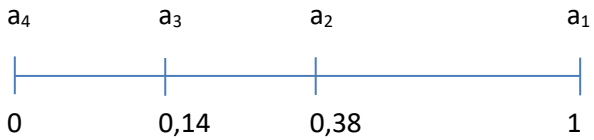
The undisputed priority of the circular economy is the utilization of waste in full, therefore, $\alpha_1 = 1$. Then $C_{BB,i} = 1$ at $BB_{SB,i1} = 1$. This means that 100% utilization of waste will have the maximum value of the consolidated indicator of the structure of their use, which follows from the economic content of the problem.

Another extreme case is the disposal of waste in landfills. As a phenomenon, it should not exist, therefore $\alpha_4 = 0$. Then, $C_{BB,i} = 0$ at $BB_{SB,i4} = 1$.

"Accordingly, the determination of quantitative estimates of α_2 and α_3 and for the incineration of waste and its disposal in specially designated areas requires scientific justification. To address this issue, the paper proposes to use the proportion of "Golden Ratio", which is part of the concept of harmonious management" [20-22].

"Golden Ratio" provides for a division of the segment "[0; 1] into two intervals, in which the smaller interval is correlated with the larger in the same way as the larger interval with the whole segment. In practice, the approximate value of the larger interval is 0.62, the smaller - 0.38. In our case, the weights of the consolidated indicator of the structure of waste use will take values, as shown in Figure 1.

Figure 1. Weighting factors of the consolidated indicator of the structure of waste use in the "Golden Ratio" proportion



Source: own elaboration

"The value of the α_2 coefficient divides the segment [0; 1] in the "Golden Ratio" proportion. Given the overriding priority of waste disposal before incineration, $\alpha_2 = 0{,}38$. Similarly, coefficient α_3 divides the segment" [0; 0.38], giving the main advantage of waste incineration before disposal in specially designated areas. So, $\alpha_3 = 0{,}14$.

Thus, according to the developed concept of ecological and economic cycle development, we have built a model for assessing structural changes in waste use, which allows us to assess the direction of changes in the implementation of the principles of the circular economy.

The cluster analysis of waste management by regions is based on indicators of their use structure. This makes it possible to carry out a scientifically sound classification of Ukraine's regions, determine the centers of development of the circular economy and the causes of lags. The results of calculations according to the formula (7) are used as input data.

"The practical implementation of the method of cluster analysis involves a certain iterative process, which results in clarification of the affiliation of each of the objects of assessment to a particular group" [23-25].

1. Initial clustering. The purpose of this stage is to determine the number and primary composition of each group, which includes regions with a similar structure of waste use. The criterion for combining regions is the Euclidean distance, which is calculated between each pair of objects of study by the formula:

(8) $$D_{iz} = \sqrt{\sum_{j=1}^{m} \left(BB_{SB,ij} - BB_{SB,zj} \right)^2}$$

where D_{iz} – Euclidean distance between the i and z regions in the structure of waste use.

"Lesser values indicate greater similarity between the *i* and *z* regions. The initial clustering begins with the search for two administrative units, the distance between which is the shortest and equal to D_{min}. These two objects form a cluster, which should include all the others, the distance to which is less than $(10-K)\times D_{\min}$ where K belongs to the segment "[1; 10) and is determined so that the quality of the clustering was the highest. The K parameter affects the number of groups and their composition. The quality criterion, in this case, is the silhouette measure, which is calculated after the iterative process is completed.

The initial clustering should determine the affiliation of each region to a set of those with a similar waste management structure.

2. Re-clustering. Based on the classification of regions carried out at the previous stage, the calculation of the centers of gravity for each group is performed using the arithmetic mean. The affiliation of each region to a particular cluster is determined by finding the minimum distance between them and the calculated centers of gravity. As a result, the previous composition of each group may change. This step must be repeated iteratively as long as the numerical composition of the clusters continues to change.

"As noted above, when conducting a scientifically sound grouping of objects by a certain set of features, a topical issue is the quantitative assessment of the quality of such clustering". To do this, according to existing practice, we will calculate the silhouette measure.

(9) $$CM_i = \frac{D_{i2} - D_{i1}}{\max\left(D_{i1};\ D_{i2}\right)}, \quad CM = \frac{\sum_{i=1}^{n} CM_i}{n},$$

where CM_i is an individual indicator of the silhouette measure for the *i* object;-

D_{i1}, D_{i2} –are the distance from the *i* object to its center and the nearest cluster, respectively;

CM – generalized indicator of the silhouette measure.

The CM value can take values from -1 to 1 and should be maximized. An acceptable level of classification is achieved if $CM \geq 0{,}2$; $CM \geq 0{,}5$ is high. Otherwise, the clustering procedure must be repeated with a different value of the K parameter.

"Next, consider a model for assessing the environmental friendliness of products based on the intersectoral balance". To do this, enter the symbols:– volumes of environmental pollution are indicated by the matrix $E[n \times m]$, where *n* is an aggregate number of branches of Ukraine's economy; m is the number of types of pollution; E_{ij} is the absolute amount of pollution of the *j* type and the *i* industry during the reporting period. Then, $E_j = \sum_{i=1}^{n} E_{ij}$ is the total amount of pollution of the j-th type in the economy as a whole;

- is the vector of total output $X[n]$, where X_i is the volume of total output of the i industry. Then, $Z_{ij} = \frac{E_{ij}}{X_i}$ is the average level of the j type of pollution in the i industry, per 1 million UAH. total output.
- is the vector of final demand $F[n]$, where F_i is the value of the final demand for products of the i industry. Then, $\frac{E_{ij}}{F_i}$ is the average level of the j type of pollution by the i branch, per 1 million UAH of final demand;
- is the intermediate consumption matrix $X[n \times n]$, where Xij is the volume of intermediate consumption by the j branch of production of the i region.

Due to the high inertia of macroeconomic processes, the structure of intersectoral relations, based on the introduced symbols, is determined using a matrix of direct costs $A[n \times n]$:

(10) $$a_{ij} = \frac{X_{ij}}{X_j}$$

where a_{ij} is the direct cost ratio;

X_j is the total output of the *j* industry.

Then, the basic equation of intersectoral balance in matrix form takes the following form:

(11) $$X = AX + F$$

The solution of equation (11) assumes the finding of the aggregate output X, which satisfies the scenario final demand F and the corresponding intermediate consumption A and is written in the form (12):

(12) $X = (I - A)^{-1} F$, $B = (I - A)^{-1}$ $\rightarrow X = BF$, $\rightarrow \Delta X = B\Delta F$,

where *I* is a single matrix;

B is a full cost matrix;

ΔF, ΔX - the change in final demand and aggregate output, respectively

Therefore, the environmental indicator, or the change in the amount of pollution of the *j* type with increasing final demand for products of the *i* industry, which leads to a corresponding increase in aggregate output, will be calculated with the formula (12):

(13) $$EK_{ij} = \sum_{i=1}^{n} \left(B\Delta F_i \times Z_{ij} \right)$$

where EK_{ij} is the environmental friendliness of the production unit of the i industry by the j type of pollution.

Thus, the change in the final demand for the products of only one industry, according to the distribution effect, which is determined by the structure of intersectoral relations, leads to a corresponding change in aggregate output in all industries. This, in turn, immediately affects the amount of damage to the environment for all types of pollution. Thus, we considered the economic and mathematical support of the concept of development of the ecological and economic cycle of Ukraine's processing industry. In further research it is necessary to focus on the economic substantiation of the basic directions of introduction of bases of circular economy in activity of the enterprises of Ukraine's processing sector.

Results

According to the developed concept, the substantiation of the main directions of development of the ecological and economic cycle of Ukraine's processing industry should begin with the collection of input statistical data and the definition of many indicators to assess the level of environmental load. A detailed description of these concept blocks has been discussed above. Further, to analyze the existing environmental and economic trends in the industry, a model based on the interrelated *IEP*, *IEH* and $I_Г$ indices is used. The

corresponding components of the indices of economic development and environmental load are calculated in Table 1.

Table 1. Calculation results of the generalized index components of ecological and economic development according to the 2016-2018 data

Industries	*IEP components*		*IEH components*				
	T_{GDP}	$T_{GDP/CB}$	T_{E1}	T_{E2}	T_{E3}	T_{E4}	T_{E5}
1	2	3	4	5	6	7	8
1. Agriculture, forestry and fisheries	0,959	0,984	0,98	1,16	0,83	1,22	1,13
2. Mining and quarrying	1,057	1,076	0,98	1,14	1,13	0,83	0,85
3. Processing industry, including:	1,013	1,006	0,95	0,89	0,96	0,98	0,99
3.1. Food production	1,000	1,027	1,05	1,08	1,05	0,98	0,97
3.2. Production of coke and petroleum products	0,940	0,875	1,00	1,05	–	–	–
3.3. Metallurgical production	1,016	0,987	0,94	0,84	0,99	0,98	0,99
3.4. Other processing industry	1,035	1,018	1,00	0,97	0,75	1,01	1,01
4. Electricity, gas, steam and air supply	1,039	1,001	0,84	0,93	0,92	0,97	0,97
5. Water supply, sewerage, waste management	0,959	0,952	1,07	0,77	0,93	1,01	1,01
6. Construction	1,113	0,989	0,99	0,68	1,12	1,03	1,09
7. Other activities	1,044	0,994	0,88	0,88	0,87	1,09	0,76
Total	1,029	1,004	0,90	0,92	1,09	1,07	1,01

Source: own elaboration

According to the results of calculations, favorable conditions have developed in the processing industry in recent years, according to which moderate economic growth due to quantitative and qualitative factors was accompanied by a reduction in pollution of all kinds.

Regarding the pace of economic development, we can see from column (1) that in 2016-2018, the processing industry lagged behind the average economic level. However, in terms of production efficiency, column (2), the share of value added in total output grew faster at processing plants. Thus, the annual growth rate of sectoral GDP was + 1.28% and exceeded the corresponding growth rate of total output, which was + 0.72%. This reduced the dependence on intermediate consumption, which is positive and necessarily accompanies the process of transition to a circular economy.

Regarding the ecological load, it is possible to state the reduction of environmental pollution per 1 thousand km2 in all areas of anthropogenic impact, columns (4) - (8). The most significant among other sources is the reduction of atmospheric emissions, in particular,

carbon dioxide, which was -11.47% annually. This favorably distinguished the processing industry from the economy as a whole, as waste generation, water intake and use tended to increase here.

The next stage of the concept involves the development of recommendations for waste management. The relative effectiveness of measures to prevent waste generation can be assessed according to column (6), table. 1. In Ukraine, the annual volume of waste generation in 2016-2018 increased by 9.4%, from 295,870.1 thousand tons to 352,333.9 thousand tons. The main polluters were the mining and processing industries. Regarding processing enterprises, the volume of waste generation decreased from 34,093 thousand tons to 31,523.2 thousand tons, or -3.8% annually.

Another feature of waste generation is their territorial irregularity. The largest polluter is the Dnipropetrovsk region, where in 2018 this figure was 243,598.8 thousand tons, or 69.1% of all waste in Ukraine. The consequence of this is another problem. The total amount of waste accumulated in disposal sites in the Dnipropetrovsk region at the end of the reporting period amounted to 10712,436.6 thousand tons, or 82.6% of Ukraine's total. This is the result of activities in the extraction industry, which generates up to 87% of waste. In particular, the share of metal ore mining in their industry volume is 93.7%. In the short term, waste generation can be significantly reduced only by reorienting to foreign suppliers of raw materials and energy resources. In the course of their activities in 2018, households generated 5,543.5 thousand tons of waste, or only 1.60% of its volume in Ukraine. The next stage of the concept provided for the management of the structure of waste use on the basis of a certain hierarchy of priorities in the "Golden Ratio" proportion" [20-26].

Summary indicators of structure and structural shifts, which were calculated for Ukraine as a whole according to formulas (7), take the values: $C_{BB,2016}$ = 0.390; $C_{BB,2018}$ = 0.397; $C3_{BB}$ = +0.007. Thus, the pace of positive dynamics that has emerged in recent years will not solve the problem of insufficient waste disposal, even in the long run. In the regional aspect, the structure of waste use is quite uneven (Table 2):

Table 2. Analysis of structural changes in waste use by region according to the 2016-2018 data

Regions	Structure of waste use, %				$C_{BB,2018}$	CC_{BB}
	Utiliza-tion	Incinera-tion	Disposal in specially designated places	Placement at landfills		
1	2	3	4	5	6	7
Vinnytsia	27,03%	3,28%	69,69%	0,00%	0,383	0,080
Volyn	21,35%	3,82%	74,83%	0,00%	0,336	0,030
Dnipropetrovs'k	34,92%	0,01%	65,07%	0,00%	0,443	0,021
Donets'k	27,67%	0,02%	72,31%	0,00%	0,381	0,077
Zhytomyr	10,06%	9,07%	80,87%	0,00%	0,252	-0,030
Zakarpattia	0,21%	3,22%	96,56%	0,00%	0,154	-0,003
Zaporizhzhia	62,82%	0,99%	36,19%	0,00%	0,684	0,046
Ivano-Frankivs'k	28,07%	6,21%	65,72%	0,00%	0,399	-0,060
Kyiv	2,42%	1,54%	96,03%	0,00%	0,169	-0,008
Kirovohrad	4,89%	0,07%	95,04%	0,00%	0,186	-0,034
Luhans'k	8,16%	5,40%	86,37%	0,07%	0,227	-0,117
Lviv	16,57%	2,15%	81,28%	0,00%	0,291	-0,007
Mykolayiv	2,54%	1,19%	96,22%	0,05%	0,169	-0,007
Odessa	1,26%	7,49%	91,24%	0,00%	0,173	0,010
Poltava	13,98%	0,23%	85,79%	0,00%	0,265	-0,452
Rivne	4,79%	12,72%	82,47%	0,02%	0,215	-0,032
Sumy	23,23%	2,48%	74,29%	0,00%	0,349	-0,049
Ternopil	14,57%	0,27%	85,16%	0,00%	0,270	0,041
Kharkiv	17,50%	4,25%	78,25%	0,00%	0,304	-0,032
Kherson	8,51%	6,09%	85,40%	0,00%	0,232	0,020
Khmelnytsky	55,62%	1,12%	43,24%	0,01%	0,623	0,180
Cherkassy	53,03%	1,12%	45,84%	0,00%	0,601	-0,034
Chernivtsi	29,58%	2,69%	67,73%	0,00%	0,404	-0,019
Chernihiv	15,31%	1,95%	82,74%	0,00%	0,280	0,007
City of Kyiv	0,22%	21,78%	78,00%	0,00%	0,198	0,016

Source: own elaboration

- leaders in waste disposal in 2018, where their share exceeded 50%, were Zaporizhia (62.8%), Khmelnytsky (55.6%) and Cherkasy (53.05) regions. At the same time, the largest lags in this indicator took place in Zakarpattia (0.2%), Odesa (1.3%), Kyiv (2.4%), Mykolaiv (2.5%) and Kyiv (0) , 2%);
- despite the low average share of waste incineration in Ukraine, in certain areas it has found wide practical use: Kyiv (21.8%), Rivne (12.7%), Zhytomyr (9.1%), Odessa (7, 5%), Ivano-Frankivsk (6.2%), and Luhans'k (5.4%) regions;
- the worst situation of waste disposal was observed in Zakarpattia (96.6%), Mykolayiv (96.2%), Kyiv (96.0%), Kirovohrad (95.0%) and Odessa (91.2%) regions.

The values of the regional indicators of the structure are given in column (6) of Table 1, and structural changes that took place during 2016-2018, in column (7). As we can see, the most effective waste management, in terms of reuse, currently operates in Zaporizhia (C_{BB} = 0.684), Khmelnytsky (0.623) and Cherkasy (0.601) regions. Conversely, the most problematic regions are: Zakarpattia (0.154), Kyiv (0.169), Mykolaiv (0.169), Odessa (0.173), Kirovohrad (0.186) regions and Kyiv (0.198). There was also a pattern of structural changes: the leading regions in waste reuse improved their positions, and those with the largest lag worsened their standing.

Methods of cluster analysis allow to conduct a scientifically sound classification of regions of Ukraine according to the structure of waste use. Columns (2) - (5) of table 2 were used as input data. In substantiating the value of the *K* parameter, we proceeded from the following assumptions:

- Firstly, the high level of quality of the classification of regions must be confirmed by the appropriate value of the silhouette measure. That is, the center of each cluster must well characterize the objects that are part of it. Also, the distance of each object to the center of its cluster should be much smaller than to the centers of other clusters;
- Secondly, excessive diversification of management measures through the formation of a significant number of clusters is undesirable. Therefore, it is optimal that a small number of groups be created, and their components combined with common conditions of development.

Given the above, as a result of the clustering performed at the value of the K parameter = 2.5, we formed 4 groups of regions with a common waste use structure. The first cluster includes Zaporizhia, Khmelnytsky, and Cherkasy regions with the highest level of waste utilization (Table 3).

Table 3 Classification of areas with respect to the structure of waste use, cluster I

Regions	Structure of waste use, %				$C_{BB,2018}$	CC_{BB}
	Utilization	Incineration	Disposal	Landfills		
Zaporizhzhia	62,82%	0,99%	36,19%	0,00%	0,684	0,046
Khmelnytsky	55,62%	1,12%	43,24%	0,01%	0,623	0,180
Cherkassy	53,03%	1,12%	45,84%	0,00%	0,601	-0,034
Cluster center	57,16%	1,08%	41,76%	0,00%	0,636	–

Source: [State Statistics Committee of Ukraine]

The generalized indicator of the structure of waste use, calculated by the center of this cluster, is the maximum relative to other regions of Ukraine and is equal to 0.636. The indicator of structural changes allows us to assess the trends that took place in waste use during 2016-2018. As we can see, in Zaporizhia and Khmelnytsky regions the situation of reuse improved, while it worsened in Cherkasy region.

The next two clusters were characterized by a significant reduction in the share of recycled waste in favor of disposal in specially designated areas. They included the vast majority of Ukraine's regions. Thus, the composition of the second cluster is given (Table 4).

Table 4. Classification of areas with respect to the structure of waste use, cluster II

Regions	Structure of waste use, %				$C_{BB,2018}$	CC_{BB}
	Utilization	Incineration	Disposal	Landfills		
Vinnytsia	27,03%	3,28%	69,69%	0,00%	0,383	0,080
Volyn	21,35%	3,82%	74,83%	0,00%	0,336	0,030
Dnipropetrovs'k	34,92%	0,01%	65,07%	0,00%	0,443	0,021
Donets'k	27,67%	0,02%	72,31%	0,00%	0,381	0,077
Ivano-Frankivs'k	28,07%	6,21%	65,72%	0,00%	0,399	-0,060
Sumy	23,23%	2,48%	74,29%	0,00%	0,349	-0,049
Chernivtsi	29,58%	2,69%	67,73%	0,00%	0,404	-0,019
Cluster center	26,96%	3,79%	69,24%	0,00%	0,384	–

Source: [State Statistics Committee of Ukraine]

The center of the cluster indicates that the average share of recycled waste decreased over 2 times relative to the areas of the first group. Regarding the trends of structural changes, the relationship between C_{BB} and CC_{BB} is not identified. Thus, the problem of waste reuse in these areas is very common: taking into account incineration, this figure is around 30%.

The most numerous is the third cluster, the composition of which is presented (Table 5).

Table 5. Classification of areas with respect to the structure of waste use, cluster III

Regions	Structure of waste use, %				$C_{BB,2018}$	CC_{BB}
	Utilization	Incineration	Disposal	Landfills		
Zhytomyr	10,06%	9,07%	80,87%	0,00%	0,252	-0,030
Luhans'k	8,16%	5,40%	86,37%	0,07%	0,227	-0,117
Lviv	16,57%	2,15%	81,28%	0,00%	0,291	-0,007
Poltava	13,98%	0,23%	85,79%	0,00%	0,265	-0,452
Rivne	4,79%	12,72%	82,47%	0,02%	0,215	-0,032
Ternopil	14,57%	0,27%	85,16%	0,00%	0,270	0,041
Kharkiv	17,50%	4,25%	78,25%	0,00%	0,304	-0,032

Kherson	8,51%	6,09%	85,40%	0,00%	0,232	0,020
Chernihiv	15,31%	1,95%	82,74%	0,00%	0,280	0,007
City of Kyiv	0,22%	21,78%	78,00%	0,00%	0,198	0,016
Cluster center	8,01%	9,94%	82,05%	0,00%	0,236	–

Source: [State Statistics Committee of Ukraine]

In addition to a significant reduction in the share of recycling, the areas of this cluster have the largest share of waste incineration among the regions in order to obtain energy. However, waste disposal is dominant and exceeds 80%. As a result, the C_{BB} indicator for the center of the cluster is 0.236, which is extremely low.

The analysis of structural shifts testifies to multidirectional dynamics in the directions of waste management. Poltava region deserves special attention. During 2016-2018, the share of recycling decreased from 66.7% to 14.0%. This is the largest reduction in all of Ukraine. The causes of this phenomenon are an increase in waste generation by 3.7 times, from 5,421.3 to 1,9825.7 thousand tons. At the same time, the volume of utilization decreased by 23.3%, from 3,615.2 to 2,771.7 thousand tons. The last, fourth, cluster unites regions where waste utilization is practically absent (Table 6).

Table 6. Classification of areas with respect to the structure of waste use, cluster IV

Regions	Structure of waste use,, %				$C_{BB,2018}$	CC_{BB}
	Utilization	Incineration	Disposal	Landfills		
Zakarpattia	0,21%	3,22%	96,56%	0,00%	0,154	-0,003
Kyiv	2,42%	1,54%	96,03%	0,00%	0,169	-0,008
Kirovohrad	4,89%	0,07%	95,04%	0,00%	0,186	-0,034
Mykolayiv	2,54%	1,19%	96,22%	0,05%	0,169	-0,007
Odessa	1,26%	7,49%	91,24%	0,00%	0,173	0,010
Cluster center	2,90%	2,92%	94,17%	0,02%	0,176	–

Source: [State Statistics Committee of Ukraine]

As a result, the indicator of the structure of waste use, calculated by the center of the cluster, took the lowest value among those discussed above, which is negative.

As a result of the grouping, the indicator of the silhouette measure will be equal to $(CM = 0{,}64) \geq 0{,}50$, which corresponds to a high level. Therefore, when developing measures for the implementation of the principles and provisions of the circular economy in the activities of processing enterprises, it is possible to take into account the regional division by the use of waste. Based on the results of the analysis, it can be concluded that in Ukraine today the restrictions on the circular economy regarding the complete reuse of waste are not

met. Moreover, the existing structure of waste use and the corresponding structural changes indicate that companies are not interested in implementing any changes to improve the environment. This is a systemic problem in almost the entire territory of Ukraine, except for three regions.

"The main reason for this unsatisfactory situation is the operation of the mining industry, in particular, the extraction of metal ores, due to which more than 80% of the volume of all industrial and household waste is generated annually in Ukraine" [27]. They include: residues of unextracted components, which may be up to 15-20% of the initial volume of extraction; oxidized quartzite; silicate and carbonate; natural stone and clay rocks; gravel and sand.

Areas of possible use of these types of waste are: further processing and extraction of residual minerals at ferrous metallurgy enterprises, as building materials for the construction industry. However, given the use of outdated technologies, further processing is not economically viable. On average in Ukraine, the total amount of accumulated waste per 1 km^2 in 2018 was 22,498.9 tons, i.e 306,896 kg per person. However, these averages are not representative, as they poorly characterize the study population: almost all regions, except for a few, have much lower concentrations.

Table 7. Calculation of the integrated indicator of accumulated waste according to the 2018 data

Regions	Accumulated waste		Normalized accumulated amount of waste		Integral indicator, %
	Tons per 1 km^2	Kg per 1 person	Tons per 1 km^2	Kg per 1 person	
1	2	3	4	5	6
Vinnytsia	1201,8	20305	0,9964	0,9939	99,03%
Volyn	408,2	7931	0,9988	0,9976	99,64%
Dnipropetrovs'k	335571,1	3328076	0,0000	0,0000	0,00%
Donets'k	33996,4	215502	0,8987	0,9352	84,05%
Zhytomyr	178,3	4339	0,9995	0,9987	99,82%
Zakarpattia	190,9	1936	0,9994	0,9994	99,88%
Zaporizhzhia	6064,1	96144	0,9819	0,9711	95,36%
Ivano-Frankivs'k	3253,9	32948	0,9903	0,9901	98,05%
Kyiv	1618	25835	0,9952	0,9922	98,75%
Kirovohrad	21011,1	543298	0,9374	0,8368	78,44%
Luhans'k	2415,2	29838	0,9928	0,9910	98,39%

Lviv	10513,4	90869	0,9687	0,9727	94,22%
Mykolayiv	2223,6	48113	0,9934	0,9855	97,90%
Odessa	357,7	5004	0,9989	0,9985	99,74%
Poltava	968,7	19793	0,9971	0,9941	99,12%
Rivne	1300	22491	0,9961	0,9932	98,94%
Sumy	1501,7	32899	0,9955	0,9901	98,57%
Ternopil	40,2	529	0,9999	0,9998	99,97%
Kharkiv	1377,8	16123	0,9959	0,9952	99,11%
Kherson	46	1256	0,9999	0,9996	99,95%
Khmelnytsky	431,2	7006	0,9987	0,9979	99,66%
Cherkassy	319,4	5506	0,9990	0,9983	99,74%
Chernivtsi	416,6	3725	0,9988	0,9989	99,76%
Chernihiv	365,9	11523	0,9989	0,9965	99,55%
City of Kyiv	14818,7	4210	0,9558	0,9987	95,46%

Source: [State Statistics Committee of Ukraine]

As can be seen in Table 7, the highest concentration of waste per unit area and one person took place in the Dnipropetrovsk region. According to these indicators, it exceeded hundreds of times the level of pollution in other regions and significantly affected the average level of these indicators in Ukraine.

Also among the leaders of the anti-rating are Kirovograd, Donets'k, Lviv, Zaporizhia regions and the city of Kyiv. In contrast, minimal waste concentrations were observed in Ternopil, Kherson, Zakarpattia, and Zhytomyr regions.

Thus, today the problem of effective waste management, taking into account the criteria and constraints of the circular economy, is most relevant in the industrial regions of the country.

Summary, recommendations

Summing up, in order to form a closed ecological and economic cycle of Ukraine's processing industry, taking into account the existing specifics of functioning and development, it is necessary to actively implement the following measures:

1. The calculation of the generalized index of ecological and economic efficiency ($I_Г$ = 1,058) showed that in the processing industry during 2016-2018, there were favorable conditions for moderate economic growth, which was accompanied by a reduction in pollution of all kinds.

A positive result was achieved due to metallurgical production and mechanical engineering. Since the development and implementation of closed-loop technologies in production activities requires significant investment resources, the recommendations in this case are to maintain existing trends by intensifying and further implementing environmental measures.

2. The annual volume of waste generation in Ukraine in 2016-2018 increased from 295,870.1 thousand tons to 352,333.9 thousand tons. The main polluters were the mining and processing industries. Regarding processing enterprises, their waste generation decreased annually by 3.8% to 31,523.2 thousand tons. In the course of their lives, households annually generated only 1.6% of the total waste in Ukraine.

An important feature of waste generation is its territorial irregularity. The largest polluter is the Dnipropetrovsk region, where in 2018 this figure was 243,598.8 thousand tons, or 69.1% of all waste in Ukraine. Due to this, the total amount of waste accumulated in disposal sites in the Dnipropetrovsk region at the end of the reporting period was 82.6% of Ukraine's total. This is the result of activities in the extractive industry, which generates up to 87% of waste. In particular, the share of metal ore mining in their industry volume is 93.7%. Accordingly, the share of the processing industry is 9.1%. Thus, the implementation of measures to minimize waste generation only within the processing industry will not be able to radically solve the problem of this environmental disaster in the Dnipropetrovsk region. The solution can only be a comprehensive modernization of the entire economy, in particular, the extractive industry. In the short term, waste generation can be significantly reduced only by reorienting to foreign suppliers of raw materials and energy resources.

3. The circular economy pays considerable attention to waste recycling, namely, maximizing their reuse. Therefore, an important stage of the study was the management of the structure of waste use on the basis of a certain hierarchy of priorities in the "Golden Ratio" proportion. The largest share, exceeding 70%, was occupied by waste disposal in specially designated areas and only about 30% disposal. This situation has developed primarily due to the extraction of iron ore. The share of waste incineration for energy purposes and their placement in landfills was less than 1%.

The main reason for this unsatisfactory situation is the activity of the mining industry, in particular, the extraction of metal ores, due to which Ukraine annually generates more than 80% of all industrial and household waste. They include: residues of unextracted components,

which may be up to 15-20% of the initial volume of extraction; oxidized quartzites; silicate and carbonate; natural stone and clay rocks; gravel and sand. Areas of possible use of these kinds of waste are: further processing and extraction of residual minerals at ferrous metallurgy enterprises, as building materials for the construction industry. However, given the use of outdated technologies, further processing is not economically viable. Therefore, in the long run, Ukraine's industry should reorient from the extraction and primary processing of resources to the production of high-tech products with a high share of added value, which will significantly reduce the volume of industrial waste. At the same time, the absolute volume and share of extractive industry products in total output in the economy should be reduced.

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Determination of Factors Affecting Sustainable Development of the Insurance Market in Ukraine

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Abstract. Determination of the most influential factors affecting sustainable development of the insurance market is quite important for providing sustainable economy. In this context, information plays a great role in the decision-making process of government authorities, providers and consumers of insurance services. So it is necessary to define what information may be useful. The goal of the research is to select complex factors affecting sustainable development of the insurance market using the case of the Ukrainian insurance market. It was done with the help of factor analysis (selection method: principal component analysis; rotation method: varimax) in SPSS using open data of Ukrainian government institutions (2001-2018 years). The research made it possible to determine among 10 factors (average salary of physical entities, inflation rate, number of insurers, level of insurance payments, number of insurance brokers, insurance reserves, assets of insurers, charter capital of insurers, insurance density, share of foreign reinsurance premiums in total insurance premiums) 2 significant complex factors: solvency of insurers and solvency of consumers of insurance services affecting sustainable development of the insurance market of Ukraine. These results mean that it is necessary to decrease influence of these complex factors under implementation of Directive 2009/138/EC Solvency II into institutional environments of the Ukrainian insurance market under conditions of implementation of European integration vector by financial and other authorities of Ukraine. For sustainable development of the insurance market of Ukraine, it is essential to create and implement national and regional programs of sustainable development of the insurance market of Ukraine. The structure of such programs is suggested.

Key words: factor analysis, sustainable development, insurance market

JEL: G22, G28, G29

Introduction

The developed insurance market is defined as one of the required conditions for the functioning of a stable country's economy, but to achieve this goal, firstly, it is necessary to ensure sustainable development of the insurance market. In this paper, 'sustainable development of insurance market' means the development of the insurance market by types of clients (physical and legal entities), types of insurance services, its prices and regional distribution that meets interests of shareholders, insurance companies, consumers and state within social, economic and ecological dimensions of sustainable development. These dimensions can be achieved by different types of insurance (health, pension and life

insurance, property and liability insurance, ecological insurance). Emerging countries have lots of disproportions in the development of the insurance market [Sholoiko, 2014, pp. 60-65], namely: predominant development of property insurance, legal entities as main clients of insurance companies, expensive insurance services distributed mainly in big cities.

A great number of factors impact sustainable development of the insurance market. Lots of information and poor-quality data make it difficult to determine the most influential factors for taking them into account in the work of legal authorities. Thus it is important to investigate such issues, based on different sources of data.

Theoretical premises

There are many articles about the bilateral connection between insurance and economic growth [Alhassan, 2016, pp. 321-339; Lee, Chang, Arouri, 2016, pp. 361-369; Mohyul, Regupathi, 2017, pp. 501-519]. Issues on sustainable development of insurance industry and its impact on sustainable development are represented in research projects made by Kanojia, Ho, Huang, Ou, Lapinskaite, Radikaite [Kanojia, 2014, pp. 227-232, Lapinskaite, Radikaite, 2015, pp. 446-464, Ho, Huang, Ou, 2018, pp. 391-410]. A separate area of studying the impact of insurance companies on sustainable development of the economy is the research of investing the resources of insurance reserves of life insurance companies in green bonds or their own issuing of such securities. This aspect is reflected in the following works: [Moid, 2017, pp. 63-78; Jakubik, Uguz, 2021, pp. 381-393].

A significant amount of publications is devoted to indicators of development and security of the insurance market, such as insurance penetration, insurance density, share of life insurance, share of foreign reinsurance [Prikazyuk, Motashko, 2015, pp. 288-310; Tereshchenko, 2020, pp. 159-167; Valinkevych, Polchanov, Kovalenko, 2020, pp. 15-24]. These research works explain positive or negative tendencies of the development of the insurance market due to the impact of factors such as economic prosperity or crisis and instability, low or high inflation, low or high income of physical and legal entities, solvency or insolvency of insurers, etc. But the factors mentioned above are interconnected and it is necessary to combine them and continue further research using fewer factors.

Therefore the goal of this research is to select complex factors affecting sustainable development of the insurance market using the case of the Ukrainian insurance market.

Methodology

The determination of factors affecting sustainable development of the insurance market was done using factor analysis (selection method: principal component analysis; rotation method: varimax with Kaiser Normalization) that is supported by IBM SPSS Statistics 21. The initial conditions of applying such a method are the following:

1. quantitative data;
2. data without gaps;
3. number of input factors not less than 10.

The ways of collecting such data can be several:

1. open data of government institutions;
2. questioning of the target audience;
3. combination of 1 and 2.

Questioning of the target audience can have gaps in data, that is why open data of Ukrainian government institutions (2001-2018 years) was used. This way of collecting data determines the list of factors that impact sustainable development of the Ukrainian insurance market:

1. average salary as main income of physical entities in Ukraine and primary source for insurance premiums (Av_salary);
2. inflation rate (Inflation);
3. number of insurers as providers of insurance services (Insurers);
4. level of insurance payments as a key indicator of responsibility of insurers (Level_ins_paym);
5. number of insurance brokers as intermediaries between providers and consumers of insurance services (Ins_brokers);
6. insurance reserves as a guarantee of future insurance payments by insurers (Ins_reserves);
7. assets of insurers – quality and amount of assets are also a guarantee of future insurance payments by insurers (Assets_of_ins);
8. charter capital of insurers – capitalization of the insurance market plays an important role in sustainable development of the insurance market (Charter_cap_ins);

9. insurance density means spending on insurance services per person (Ins_dens);
10. share of foreign reinsurance premiums in total insurance premiums is one of the components of financial security of insurers (Ins_rein_f).

After applying the factor analysis, it will be determined which of the above factors must be part of the selected complex factors that will allow their author's interpretation as a basis for developing proposals for the creation and implementation of national and regional programs of sustainable development of the insurance market of Ukraine.

Results

Determination of factors affecting sustainable development of the insurance market consists of several stages.

1. First of all, it is necessary to describe all the factors and make sure that they are quantitative (see Table. 1).

Table. 1. Description of factors

N	Factor	Type	Width	Decimal characters	Missing values
1	Av_salary	Numerical	8	0	No
2	Inflation	Numerical	8	1	No
3	Insurers	Numerical	8	0	No
4	Level_ins_paym	Numerical	8	1	No
5	Ins_brokers	Numerical	8	0	No
6	Ins_reserves	Numerical	8	1	No
7	Assets_of_ins	Numerical	8	1	No
8	Charter_cap_ins	Numerical	8	1	No
9	Ins_dens	Numerical	8	1	No
10	Ins_rein_f	Numerical	8	2	No

Source: created by authors in SPSS

2. The next stage consists of inputting data from open data sources of Ukrainian government institutions (2001-2018 years) (see Table 2).

Table.2. Inputting data

Year	Av_salary	Inflation	Insurers	Level_ins_paym	Ins_brokers	Ins_reserves	Assets_of_ins	Charter_cap_ins	Ins_dens	Ins_reins_f
2001	311	106,1	328	16,0	43	1179,1	3007,4	1036,8	51,8	25,90
2002	376	99,4	338	14,2	61	1896,1	5329,4	1550,5	76,0	29,50
2003	462	108,2	357	11,6	80	3774,9	10457,4	3646,0	144,8	34,80
2004	590	112,3	387	14,6	78	8272,2	20012,8	5623,0	204,3	9,78
2005	806	110,3	398	20,7	75	5045,8	20920,1	6688,0	159,5	5,00
2006	1041	111,6	411	26,5	69	6014,1	23994,6	8391,2	188,2	4,10
2007	1351	116,6	446	31,4	64	8423,3	32213,0	10633,6	266,2	4,30
2008	1806	122,3	469	41,0	57	10904,1	41931,0	13206,4	346,7	4,30
2009	1906	112,3	450	47,8	57	10141,3	41970,1	14876,0	275,8	5,40
2010	2250	109,1	456	44,2	60	11371,8	45234,6	14429,2	291,0	4,30
2011	2648	104,6	442	26,2	60	11179,3	48122,7	14091,8	394,1	5,20
2012	3041	99,8	414	24,5	64	12577,6	56224,7	14579,0	445,2	6,00
2013	3282	100,5	407	21,2	63	14435,7	66387,5	15232,5	474,7	5,70
2014	3480	124,9	382	26,3	61	15828,0	70261,2	15120,9	433,4	5,70
2015	4195	143,3	361	34,0	61	18376,3	60729,1	14474,8	522,8	8,50
2016	5183	112,4	310	32,3	75	20936,7	56075,6	12661,6	621,4	11,30
2017	7104	113,7	294	36,0	75	22864,4	57381,0	12831,3	672,3	7,80
2018	8865	109,8	281	36,1	70	26975,6	63493,3	12636,6	816,7	6,10

Source: compiledin SPSS based on: [National Bank of Ukraine, index.minfin.com.ua]

3. Then, it is possible to use factor analysis (selection method: principal component analysis; rotation method: varimax with Kaiser Normalization) (see Table 3).

Table.3. Application of factor analysis

Year	FAC1_1	FAC2_1
2001	-1,70469	-0,39088
2002	-1,92537	0,16433
2003	-1,90246	0,69991
2004	-0,91451	0,10321
2005	-0,68282	-0,33494
2006	-0,33096	-0,63043
2007	0,17451	-0,94598

2008	0,79891	-1,28474
2009	0,79047	-1,29073
2010	0,75368	-1,11364
2011	0,39903	-0,59433
2012	0,35786	-0,10848
2013	0,46439	0,05693
2014	0,78148	0,02389
2015	0,99541	0,25354
2016	0,39349	1,47457
2017	0,65159	1,76322
2018	0,9	2,15454

Source: calculated by authors in SPSS

Table. 3 shows that we get 2 complex factors named as components that explain 75.699% of dispersion (Table 5).

Table 4. A full explanation of the dispersions

Component	***Initial eigenvalues***			**Sum of squared extraction loads**		
	Total	% Dispersion	Cumulative %	Total	% Dispersion	Cumulative %
1	5,351	53,513	53,513	5,351	53,513	53,513
2	2,219	22,186	75,699	2,219	22,186	75,699
3	,914	9,140	84,839			
4	,830	8,305	93,143			
5	,395	3,950	97,094			
6	,229	2,290	99,383			
7	,042	,419	99,802			
8	,011	,109	99,911			
9	,007	,065	99,977			
10	,002	,023	100,000			

Source: calculated by authors in SPSS

To interpret these two components (which are more informative than others), it is necessary to find out which factors they include (Table 5).

Table 5. Component matrix

Factors	**Component**	
	1	**2**
Charter_cap_ins	,961	-,041
Assets_of_ins	,900	,284
Ins_rein_f	-,834	,229
Level_ins_paym	,822	-,166

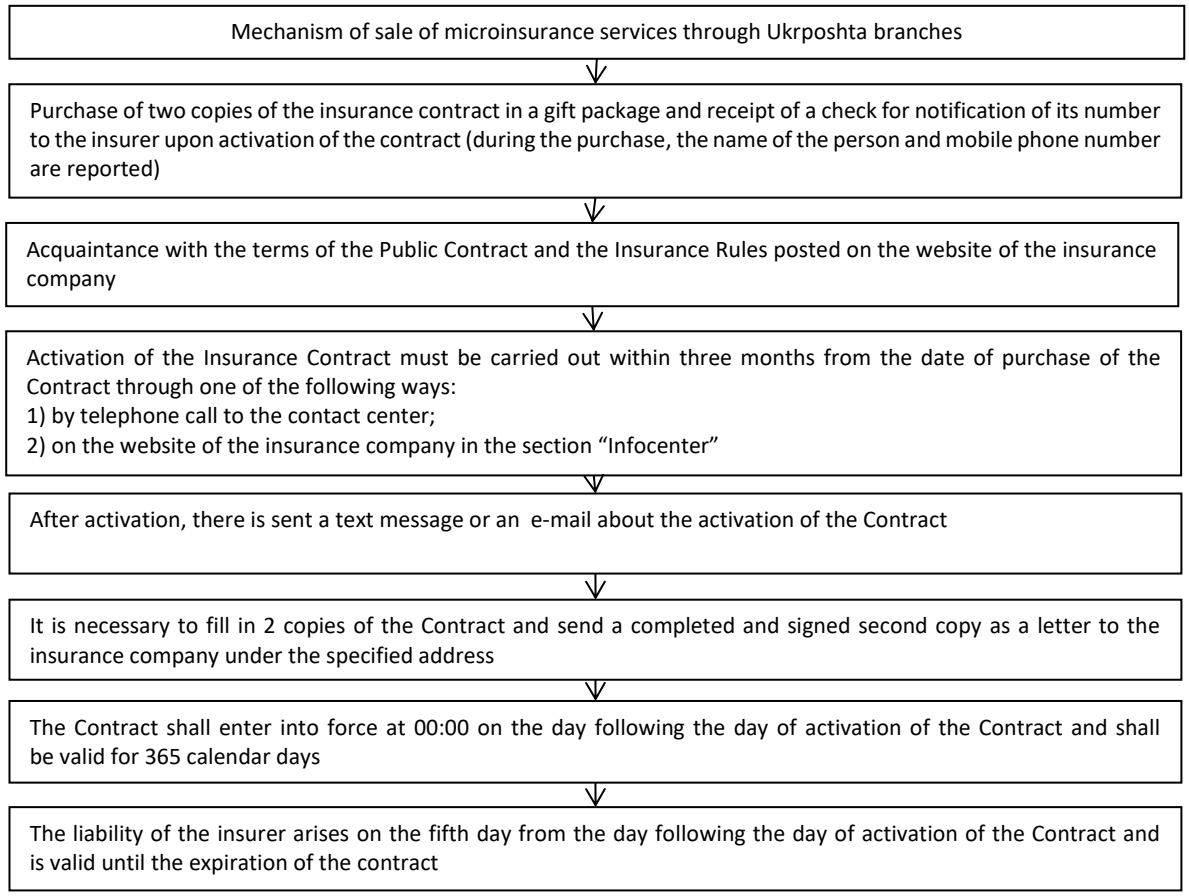
Ins_reserves	,772	,630
Ins_dens	,751	,642
Inflation	,439	-,024
Insurers	,243	-,905
Av_salary	,652	,726
Ins_brokers	-,099	,548

Source: Calculated by authors in SPSS

Table 5 represents which factors load components. It is normal when meaning of the factor is 0.7 and more. Thus, it is possible to interpret that the first component affecting sustainable development of the Ukrainian insurance market is connected with solvency of insurers, because it includes such factors as charter capital of insurers (0.961), assets of insurers (0.900), level of insurance payments (0.822), insurance reserves (0.772), insurance density (0.751). The second component affecting sustainable development of the Ukrainian insurance market is connected with solvency of consumers of insurance services, because it includes such a factor as the average salary of physical entities in Ukraine (0,726). So these components are “two sides of the same coin”: for increasing the level of consumption of insurance services in Ukraine, it is vital to increase both the level of solvency of insurers and potential policy holders.

In this situation, in order to increase the availability of insurance services in Ukraine according to the insurer’s pricing policy and income level, regardless of the region of residence, it is necessary to more actively introduce microinsurance through a variety of distribution channels. A few years ago, one of the insurance companies made such an attempt, starting to distribute insurance services worth from UAH 60 through the post offices of the national communication operator Ukrposhta. It worked as follows (Figure. 1).

Figure 1. Mechanism of sale of microinsurance services through Ukrposhta branches



Source: compiled on the basis of insurance company data

The advantage of the introduction of such services was their simplification and focus not only on property, but also on personal matters, such as health and efficiency (Table 6).

Table 6. Characteristics of microinsurance products distributed through Ukrposhta branches

Name of the insurance product	Sum insured, UAH	The cost of the insurance product, UAH	Term of the contract	Note
Child protection (child accident insurance)	10000	60	1 year	Payment is made according to a simplified procedure
Health protection (adult insurance against accidents and diseases)	10000	80	1 year	
Protection of passengers from an accident while in a car	5000	60	1 year	Round-the-clock support
Driver protection	5000	70	1 year	

Source: own work compiled on the basis of insurance company data

However, today, specified microinsurance services are no longer distributed through Ukrposhta branches. One of the reasons for this situation is the fact that, for example, microinsurance services for the protection of property included a deduction, as well as the distribution of the established insignificant limit of the sum insured on the components of the insured events, which had a low probability of occurrence, and therefore a low probability of insurance payment realization to the consumer took place. This did not contribute to the spread of microinsurance, which could boost the development of the insurance market in less developed regions of Ukraine, as now insurance is mostly concentrated in big cities, while inclusiveness assumes insurance coverage of all territories and all types of insurance consumers due to a wide range and affordability of insurance services.

At the same time, sustainable development of the insurance market of Ukraine is influenced not only by quantitative factors, but also by some non-quantitative ones, for example, institutional and legal support, which is outdated and does not take into account modern realities and challenges. To ensure sustainable development of the insurance market of Ukraine at the state and regional levels, it is advisable to develop and adopt a national program of sustainable development of the insurance market, and within such a national program, regional programs for sustainable development of the insurance market should be worked out and adopted for each region. Ukraine has adopted only two programs for the development of the insurance market and one for the development of the financial sector:

- The program of development of the domestic insurance market for 1998-2000 (devoted to the improvement of the institutional and legal infrastructure in terms of improving the Law of Ukraine “On Insurance” and institutional and organizational infrastructure, in particular the development of associations of insurers and actuaries, as well as emergency commissioners, but the purpose of the program was not specified and no attention was paid to the development of other groups of infrastructure entities of the insurance market) [Resolution of the Cabinet of Ministers of Ukraine, 1998];
- The program of development of the insurance market of Ukraine for 2001-2004 (contained the purpose of the program, principles of insurance market development, provisions on development of institutional and legal infrastructure concerning adaptation of the Law of Ukraine “On insurance” to EU requirements, formation of socially oriented insurance services, strengthening of insurance

industry staffing, etc., but there are no provisions for the development of institutional and organizational infrastructure of the insurance market of Ukraine) [Resolution of the Cabinet of Ministers of Ukraine, 2001];

- The comprehensive program for the development of the financial sector of Ukraine until 2020 (devoted to financial stability and sustainable development, financial sector infrastructure (more attention is paid to insurance companies as infrastructural entities of the financial sector), institutional capacity of regulators and the Deposit Guarantee Fund for Individuals, protection of the rights of consumers of financial services and creditors, but the listed above is only partially focused on problems of the development of the insurance market of Ukraine and its infrastructure) [Resolution of the Board of the National Bank of Ukraine, 2015].

We believe that, in accordance with the Resolution of the Cabinet of Ministers of Ukraine "On approval of the Procedure for development and implementation of state target programs" [Resolution of the Cabinet of Ministers of Ukraine, 2007], a new national program and relevant regional programs for sustainable development of the insurance market of Ukraine and its infrastructure should contain the following components:

1) Justification of the program's expediency (the presence of the problem and the reasons for its occurrence). The main problems of the insurance market should include low capacity of the insurance market (due to low capitalization of insurance companies or solvency), which does not allow to keep catastrophic risks in the national market; insufficient competitiveness of insurance companies (in particular due to the narrow range and poor quality of insurance services); unsatisfactory level of insurance culture of consumers of insurance services and insufficient protection of their interests. Regarding the insurance market infrastructure, the institutional and legal infrastructure (in the direction of its improvement by adapting international standards, in particular the Insurance Core Principles and EU Directives to domestic conditions) and institutional and organizational infrastructure (in the direction of its modernization to strengthen the security of the insurance market and the state) need transformation.
2) The purpose of the program (that sustainable development of the insurance market and its infrastructure are necessary to increase the competitiveness

of major and infrastructural entities and strengthen the security of the insurance market of Ukraine and the security of the state);

3) Directions for solving the problem:
   - development of the main subjects of the insurance market in terms of increasing their solvency and the range of competitive and affordable insurance services;
   - development of the institutional and legal infrastructure of the insurance market, in terms of improving both general and special formal components (in particular, it is advisable to develop the Insurance Code of Ukraine, which would take into account key provisions of the Insurance Core Principles and EU Directives);
   - development of the institutional and organizational infrastructure of the insurance market, in terms of protection of the rights of consumers of insurance services and prevention of bad faith in the field of insurance; increasing the capacity of the insurance market; information support; self-regulation.
4) The results of the program implementation (achievement of the goal) and the legally permitted resources required for its implementation.

This structure of the Program will allow focusing on modernization of both the structure (insurance market and its main subjects) and infrastructure (institutions and infrastructure organizations, infrastructure services and assets provided by them) for sustainable development of the insurance market.

Conclusion and recommendations

Being influenced by lots of factors and information, the application of factor analysis (10 factors) leads to determination of significant complex factors (2 components: solvency of insurers and solvency of consumers of insurance services) affecting sustainable development of the insurance market (the case of Ukraine). These results mean that it is vital for financial and other authorities of Ukraine to pay special attention to given complex factors for encouraging further sustainable development of the insurance market. For instance, it can be accounted within implementation of Directive 2009/138/EC of the European Parliament

and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II) into institutional environments of the Ukrainian insurance market under implementation of European integration vector. For sustainable development of the insurance market of Ukraine, it is necessary to create and implement national and regional programs of sustainable development of the insurance market of Ukraine with the following directions for solving the problem:

- strengthen the solvency of insurers and potential policyholders (through creating a range of competitive and affordable insurance services (microinsurance services));
- develop the institutional and legal infrastructure of the insurance market (development and implementation of adequate “rules of the game”);
- develop the institutional and organizational infrastructure of the insurance market (expanding the circle of “game participants”).

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The energy efficiency of a country under the Green Deal Policy: the causal relationship between key determinants[1]

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Abstract: The paper aimed to check the impact of the core determinants on a country's energy efficiency policy. At the first stage of the investigation, the bibliometric analysis was used. It allowed identifying the determinants analysed by the scientists under the estimation of the country's energy efficiency policy. Thus, the following indicators were allocated: green investment; greenhouse gas emissions; share of the renewable energy in the final energy consumption. The study used the indicator energy efficiency for estimating energy efficiency policy of the country. The study used the bibliometrics analysis with instruments as follows as: Scopus and Web of Science Analysis Tools (to analyse the general tendency of publication activities); VOSviewer (to visualise the findings of meta-analysis); SciVal (for collaboration analysis). For the checking of the casual relationships between selected indicators, the following methods were applied: panel unit root test, Pedroni panel cointegration tests, the fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) panel cointegration techniques, Granger causality test. The data from the following databases were used: the Eurostat, Ukrstat and the European Environmental Agency. The findings confirmed the bi-directional causality between energy efficiency and renewable energy, unidirectional causality from greenhouse gas emissions to energy efficiency. Besides, considering the results of cointegration analysis, increasing the share of renewable energy in the final energy consumption provoked: the increasing the energy efficiency by 46% (FMOLS) and 32% (DOLS). The increasing of greenhouse gas emissions by 1% initiated declining of energy efficiency by 16% (FMOLS) and 28% (DOLS); growing of green investment by 1% allowed the increasing of energy efficiency of the country by 71% (FMOLS) and 72% (DOLS). In this case, the government should implement effective instruments and policies to decline air pollution. Thus, under the transition process to the carbon-free economy, the additional green investment for renewable energy and green technologies reduces greenhouse gas emissions.

Keywords: energy policy, energy gap, energy efficiency gap, sustainable development.

JEL: P18; P28; P48; Q43; Q48

Introduction

The strengthening of energy efficiency issues and countries' energy dependency provokes the analysis and allocation of the main parameters that influence its changes. The Sustainable Development Goal (SDGs) 2030 (which contained 17 goals) involved seven goals focused on the affordable energy recourses for everyone. The 7th goal includes five main targets. One of the SDGs targets is increasing energy efficiency by developing green energy and clean technologies. Besides, in 2019, EU and Ukraine started to implement the "Green

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Deal Policy" which aimed to transition into the carbon-free economy and increase the country's energy efficiency. The analysis results showed that for the developing countries, the increase in energy efficiency was the consequence of the declining of industrial production in the country. Besides, the developing countries had inefficient technology, which limited energy production.

Moreover, countries had imbalances in all sectors, which justified spending financial sources on the essential areas. In this case, the emerging economies do not have enough financial sources to develop renewable energy and green technologies, increasing the country's energy efficiency. Thus, it is necessary to analyse the main parameters and determinants of the government's energy efficiency policy.

Theoretical premises

The findings proved that scientists identify the massive range of the parameters that influence a country's energy efficiency. In this case, to highlight the scientific trends in the energy efficiency investigations and core parameters that influenced energy efficiency, the study provided the bibliometric analysis. For the bibliometric analysis, the study combined the methodology described in the papers: [Akhundova et al., 2020; Ziabina & Pimonenko, 2020; Mikhnevych et al., 2020; Bilan et al., 2020; Panchenko et al,. 2020; Pereira et al., 2019]. The core requirement was that all papers should be published in a Scientific Journal that indexed in Web of Science and Scopus. Besides, the list of the documents was trimmed (105 357 papers) to eliminate the duplication. In general, the study used limitations as follows as:

- time 1991-2020;
- published in English;
- indexed in the scientific databases Web of Science and Scopus;
- keywords: energy efficiency, energy policy and carbon-free economy.

After the first stage, the 105 357 papers were selected. In the next step of the analysis, the subject areas of the papers were limited to identify the perspective direction in economics areas on energy efficiency analysis. The study excluded all engineering and technical subject areas. After the limitation, 1,380.0 were left for further research. The Scopus and Web of Science Tools Analysis allowed identifying the publication activities' general tendency, allocated the core sponsors and subject areas. Scopus and Web of Science Tools Analysis

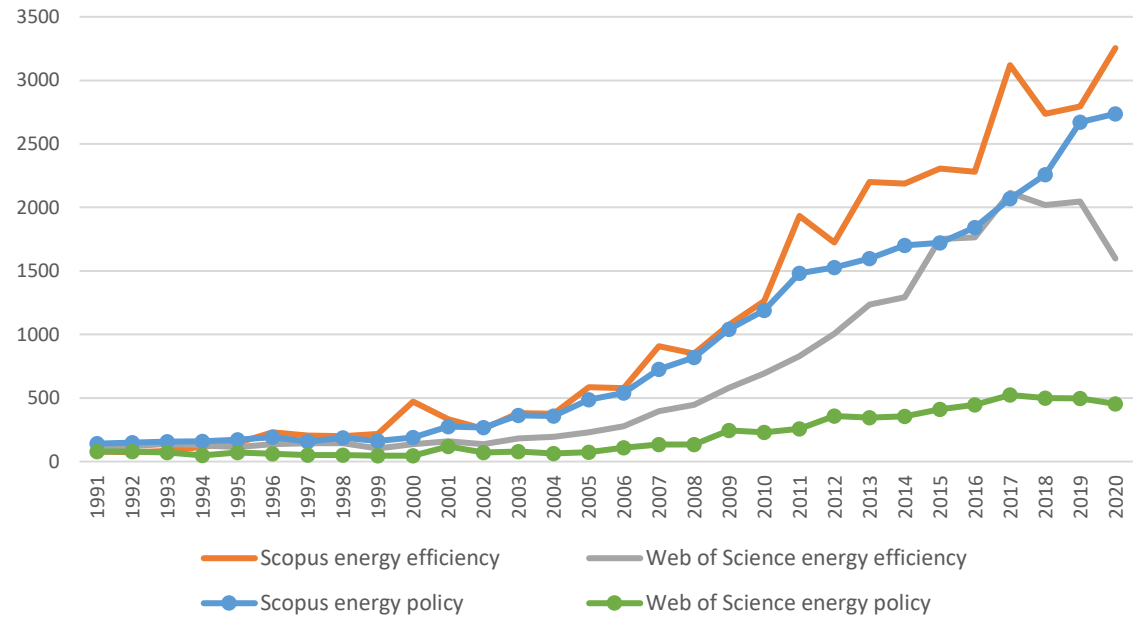
highlighted the most cited papers and scientists that analysed energy efficiency. The SciVal showed the collaboration between researchers and their impact on scientific background in the energy efficiency and energy policy. The last stage focused on the visualising of the co-occurrence analysis using software VOSviewer.

The publication activities (Table 1) showed that Scopus contained more papers that focused on the analysis of energy efficiency than Web of Science.

Table 1. Publication activities on energy efficiency in Web of Science (WOS) and Scopus for 1991-2020 years

Parameters	Numbers of the documents	
	WOS	Scopus
Keywords: Energy efficiency	20 240	32 966
Keywords: Energy policy	6 013	27 345

Dynamics of the documents

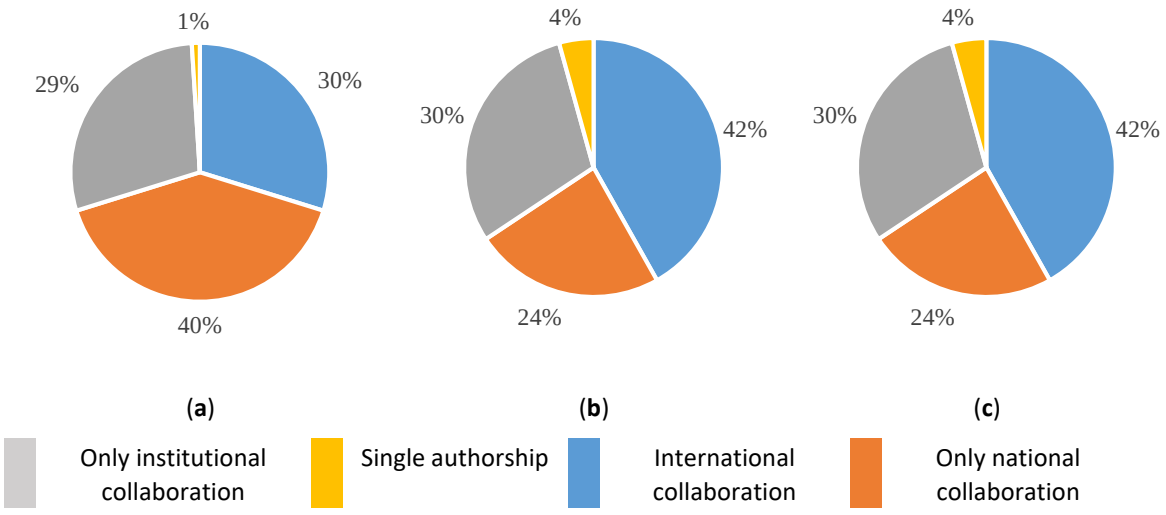


Sources: own work compiled by the authors using Scopus and Web of Science.

The findings in Table 1 confirmed the increasing tendency of publications on the energy efficiency in the scientific journals that indexed in Scopus and Web of Science for the years 1991-2020. The co-citations and co-authorship findings allowed concluding that the Chinese scientists were the most active in co-citations and had the prominent teams of authors. The results of collaboration under the investigation the energy sectors among three countries - the United States of America, China and Ukraine - showed that in the United States of America, many investigations were realised under the international cooperation – 46.6%

(Figure 1a). Simultaneously, the share of institutional collaboration (27.5%) is higher than national collaboration (20.5%). The opposite situation can be seen in China (Figure 1b), where the share of national collaboration is 40.4%, with an equal share for international (29.8%) and institutional collaboration (28.8%). In Ukraine, international collaboration is 41.8%, institutional – 30.0% and the lowest share belongs to the national cooperation – 23.8% (Figure 1c).

Figure 1. Scholarly output in the selected countries, by the amount of international, national, and institutional collaboration: (a) China; (b) Ukraine; (c) the United States.



Sources: own work compiled by the authors useing Scopus and SciVal.

The publication activities on the selected keywords in Scopus by affiliations for the years 1991-2020 are shown in Table 2. The findings confirmed that the significant sponsors of the investigation on the energy efficiency were National Natural Science Foundation of China, National Science Foundation, Department of Science and Technology, Japan Society for the Promotion of Science, Deutsche Forschungsgemeinschaft. Moreover, such results could be proved by the numbers of the documents by the countries.

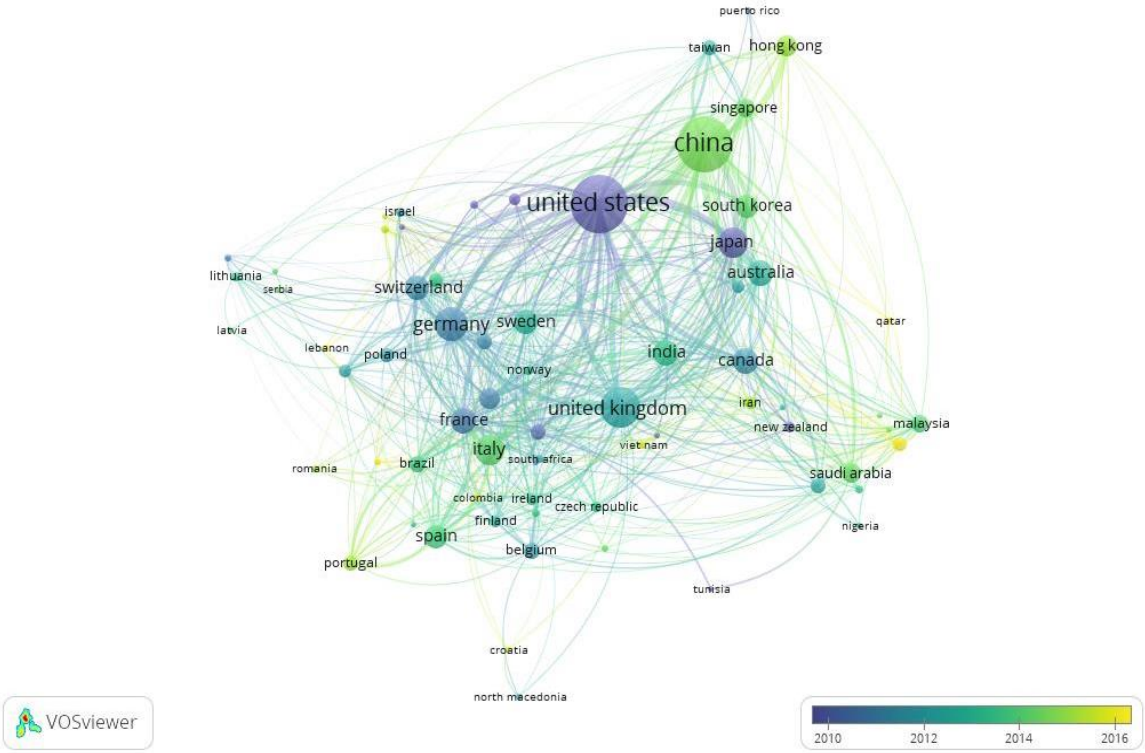
Table 2. Co-authorship citations analysis on the selected papers in Scopus for the years 1991-2019

Country	Number of papers	The biggest sponsor	The most cited paper	Number of citations
China	2682	National Natural Science Foundation of China; Fundamental Research Funds for the Central Universities	Chen et al., 2009 Ong et al., 2016	2258 2074
The United States	2315	National Science Foundation; US Department of Energy; Office of Science	Joannopoulos et al., 1997	2546
India	921	Department of Science and Technology, Ministry of Science and Technology, India; Department of Science and Technology, Government of Kerala	Norman et al., 1998	878
Japan	842	Japan Society for the Promotion of Science; Ministry of Education, Culture, Sports, Science and Technology	Asahi et al., 2001	10320
Germany	537	Deutsche Forschungsgemeinschaft	Ohta et al., 2006	2449
The United Kingdom	492	Engineering and Physical Sciences Research Council	Eperon et al., 2014	1791

Sources: own work compiled by the authors using Scopus.

The latest publications deal with the energy efficiency analysis through compilations of three areas: economic, technical and energy. In the United States and the EU countries, most papers were published in the years 2010-2012, in China in 2014. Portugal, Lebanon, Iran, and Qatar had started to investigate energy efficiency after the 2014 year (Figure 2).

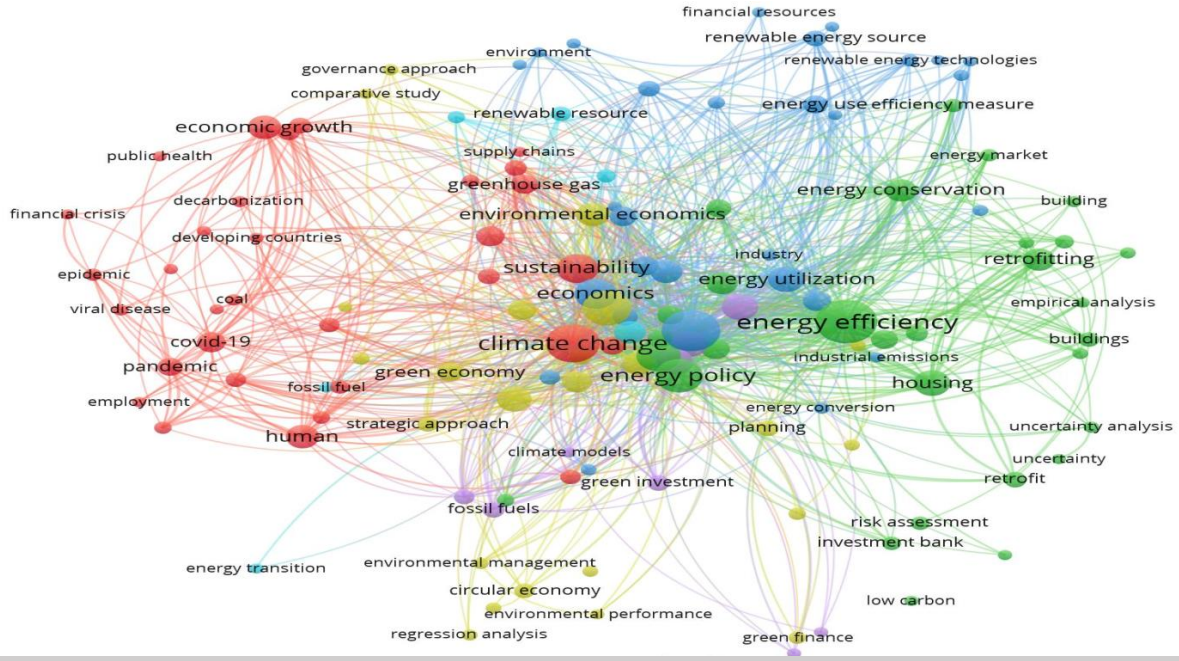
Figure 2. The visualisation of co-authorship analysis by the countries for the years 1991-2020



Sources: own work compiled by the authors using VOSviewer.

The visualisation of the co-occurrence analysis (Fig. 3) allowed identifying 6 clusters of scientists with a robust background on energy efficiency.

Figure 3. The visualisation of co-occurrences analysis for the years 1991-2020



Cluster	Number of items	Core keywords	Links	Total link strength	Occurrences
Cluster 1 (red)	32	Climate change	108	335	59
Cluster 2 (green)	32	Energy efficiency	99	421	77
Cluster 3 (navy blue)	29	Investment	115	522	72
Cluster 4 (yellow)	24	Sustainable development	102	322	49
Cluster 5 (purple)	9	Emission control	78	202	27
Cluster 6 (blue)	6	Alternative energy	67	150	21

Sources: own work compiled by the authors using VOSviewer.

The most significant cluster contained 32 items and could be called "Climate change". The second biggest cluster focused on the analysis of energy efficiency. The third cluster focused on the analysis of investment as a key driver of increasing energy efficiency and contained 29 items. The findings showed that the three most significant clusters were connected by the three intermediator clusters: alternative energy, emission control and sustainable development.

The findings proved that energy efficiency analysed toward developing solar energy and energy conservations. Furthermore, the long-distance between clusters 1 and 2 meant that the links between them were rather weak. Clusters 1, 3–6 were located close to each

other, which showed a considerable background on the investigations of the energy efficiency, renewable energy, investments and sustainability. In this case, the findings concluded that the new direction of the investigation should be focused on the analysis of the linking between energy efficiency, green investment, greenhouse gas emissions and renewable energy. Thus, the core element that led to an increase in energy efficiency was renewable energy, contributing to additional green investment. The scientists in the papers: [Chygryn & Krasnyak, 2015; Ibragimov et al., 2019a, b; Pavlyk, 2020; Pimonenko et al., 2017a; Lyulyov et al., 2020], proved that green investments increase energy efficiency. In the papers: [Cebula et al., 2018; Pimonenko et al., 2017b; Kostiukevych et al., 2020; Kwilinski et al., 2020], the authors confirmed that renewable energy positively impacted energy efficiency. The second parameter was innovation development. Thus, the innovation service and technologies lead to an increase in energy efficiency [Akimova et al., 2017; Bilanet al., 2019b; Kwilinskiet al., 2020; Lipkova & Braga, 2016; Kasztelnik & Gaines, 2019; Kendiukhov & Tvaronavičienė, 2017; Miskiewicz, 2020; Masharsky et al., 2018; Panchenko et al., 2020; Rubanovet al., 2019; Sotnyk et al., 2018; Bogachov et al., 2020; Borychowski et al., 2020; Chygryn et al., 2020; Czyżewski et al., 2019; 2020; Dalevska et al., 2019; Dementyev & Kwilinski, 2020; Dzwigol & Dźwigoł-Barosz, 2018; 2020; Dzwigol, 2019; 2020; Dzwigol et al., 2020; Kaźmierczyk & Chinalska 2018; Kharazishvili et al., 2020; Kuzior et al., 2020; Kwilinski et al., 2019; Kyrylov et al., 2020; Lyulyov et al., 2020; Miskiewicz, 2020; Pająk, et al., 2016; Saługa et al., 2020; Savchenko et al., 2019; Tkachenko et al., 2019a; 2019b; 2019c]. At the company level, the energy efficiency depended on the environmental management and implementing corporate social responsibilities [He, 2019; Kiss, 2018; Kwilinski, 2018; Leonov et al., 2017; Harafonova, Zhosan & Akimova, 2017; Wang et al., 2020]. At the country level, the efficiency of governance, reforms and financial policies provided impacted the country's energy efficiency. The authors confirmed that the environmental performance of the country [Bilan et al., 2018; Dkhili 2018; Pająket al., 2017], fiscal decentralisation [Bilanet al., 2019a; Tiutiunyk 2018; Wieland et al., 2020; Vasylieva et al., 2018], investment policy [Akimov et al., 2020; Lyeonov et al., 2019; Pimonenko, 2019], the law supporting energy innovations [Panchenko et al., 2020; Cebula & Pimonenko, 2015]. The findings proved that the scientists identified a huge range of the parameters that provoked the changes in a country's energy efficiency. Considering the bibliometric analysis, the scientists analysed the impact of green investment, greenhouse gas

emissions and renewable energy on energy efficiency under the transition to the carbon-free economy.

In this case, the paper aimed to check the causality between energy efficiency and the key determinants: green investment, greenhouse gas emissions and renewable energy.

Methodology

Considering the findings, the indicator level of energy efficiency was selected to estimate the country's energy efficiency. Besides, the bibliometric analysis results identified the core determinants of energy efficiency that were selected for the further causality relationship analysis: green investment, greenhouse gas emissions, and share of the renewable energy in the final energy consumption. For the analysis, the EU countries and Ukraine (as a potential candidate for EU) for 2009-2018 were chosen. The data for analysis were obtained from the Eurostat, Ukrstat and the European Environmental Agency. A similar methodology of analysis was used in the papers: [Ibragimov et al., 2019 a,b; Vasylieva et al., 2019]. With the purpose to check the hypothesis, the study used the following model:

(1) $$EE = f(GHG; RE; GI)$$

where EE – level of energy efficiency of the country; GHG – greenhouse gas emissions; RE – share of the renewable energy in the final energy consumption; GI – green investment.

Thus, for the investigation, the modified function (1) could be written as a panel cointegration equation:

(2) $$lnEE_{it} = \delta + \alpha lnGHG_{it} + \beta lnRE_{it} + \gamma lnGI_{it} + \varepsilon_{it}$$

where α, β, γ – regression parameters, which were evaluated and explain the elasticity of output relate on a level of energy efficiency of the country, green investment, greenhouse gas emissions and share of renewable energy in the final energy consumption; ε – the error term; i=1, ..., N; t=1, ..., T.

At the first stage, the study checked the stationarity of the date using the panel unit root test. In this case, the null hypothesis was that selected variables were non-stationary (H0). Next, the cointegration between variables was checked. Thus, the hypothesis assumed non-cointegration between the selected variables (H1). At the next stage, the long-run relationship was checked using the Fully Modified Ordinary (FMOLS) Least Square and

Dynamic Ordinary Least Square (DOLS) panel cointegration techniques. Therefore, the following hypothesis was checked:

H3: GHG, RE and GI had an impact on EE;

H4: EE, RE and GI had an impact on GHG;

H5: EE, GI and GHG had an impact on RE;

H6: EE, GHG and RE had an impact on GI.

If the long-run relationships between variables existed, the Granger causality test could be performed to check the causality among selected variables for analysis. In this case, it was the hypothesis on the absence of Granger causality between EE, RE, GHG and GI (H7). The study used the Dumitrescu-Hurlin Test: Panel Granger Causality Test. In general, the model could be presented as in formula (3):

$$Y_{i,t} = \beta_i + \sum_{i=1}^{N} \gamma_i^{(n)} y_{i,t-k} + \sum_{i=1}^{N} \delta_i^{(n)} x_{i,t-n} + \epsilon_{i,t} \quad (3)$$

where β_i indicates constant term, $\gamma_i^{(n)}$, $\delta_i^{(n)}$ lag parameter and coefficient slope, $y_{i,t}$, $x_{i,t}$ are times series.

Thus, if the p-value < 0.05, the null hypothesis (absence of Granger causality) could be rejected and the alternative hypothesis accepted – the existence Granger causality. Besides, the resulting conclusions could be:

- if causality existed between two variables, it was the bi-directional causality;
- if causality from one variable to other – unidirectional causality;
- no causality.

The study used the EViews software for the analysis.

Results

Considering the abovementioned methodology, the first stage was checking the stationarity of the selected variables. The findings of the panel unit root test are shown in Table 3.

Table 3. The finding of stationarity analysis using the panel unit root test

Type of tests	Statistic Characteristics	Variables							
		at base level				at 1st difference			
		EE	GHG	RE	GI	EE	GHG	RE	GI
Levin, Lin & Chu	Statistics	-4.79	-12.54	-2.71	-2.47	-1.04	-3.93	-8.65	-11.08
	probability	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Im, Pesaran and Shin W-stat	Statistics	-1.6	-2.87	2.13	0.76	-2.02	-1.94	-2.64	-4.94
	probability	0.05	0.002	0.98	0.78	0.00	0.00	0.00	0.00
ADF-Fisher Chi-square	Statistics	78.92	107.3	47.83	57.56	90.56	88.47	97.99	139.93
	probability	0.07	0.00	0.91	0.63	0.00	0.00	0.00	0.00
PP-Fisher Chi-square	Statistics	91.26	68.89	51.07	68.07	267.27	205.38	164.93	230.85
	probability	0.00	0.26	0.84	0.28	0.00	0.00	0.00	0.00

Source: own work

The findings in Table 3 allowed concluding that at a base level only a few variables were stationary: all variables in Levin, Lin & Chu test; greenhouse gas emissions in Im, Pesaran and Shin W-stat; energy efficiency and greenhouse gas emissions in ADF-Fisher Chi-square; energy efficiency in PP-Fisher Chi-square. Therefore, all variables become stationarity in all tests at the first level. It allowed rejecting the null hypothesis of non-stationarity at 1% significance. At the next stage of the analysis, the study conducted the cointegration between variables using the Pedroni panel cointegration test.

Table 4. The findings of cointegration between the energy efficiency of the country, green investment, greenhouse gas emissions and share of the renewable energy in the final energy consumption using the Pedroni residual cointegration test

Dimensions		**Test**	**panel v-statistic**	**panel rho-statistic**	**panel PP-statistic**	**panel ADF-statistic**
Within-dimension		Statistics	0.39	-0.06	-10.95	-11.73
		Probability	0.35	0.47	0.00*	0.00*
	weighted	Statistics	-2.46	2.34	-6.61	-5.65
		Probability	0.99	0.99	0.00*	0.00*
Between-dimension		**Test**	**group rho-statistic**	**group PP-statistic**	**group ADF-statistic**	
		Statistics	3.91	-10.54	-7.92	
		Probability	1.00	0.00*	0.00*	

*Note: * represents significance at the 1% level.*

Source: own work

The empirical results in Table 4 confirmed that six out of eleven probabilities of the test had the statistical significance at 1% level. It allowed rejecting the hypothesis of non-cointegration between a country's energy efficiency, green investment, greenhouse gas emissions, and the share of the renewable energy in the final energy consumption. Besides, the findings confirmed the long-run relationship among analysed variables. In this case, the Fully Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS) panel cointegration techniques were used. The empirical results of FMOLS and DOLS were presented in Table 5.

Table 5. The results of the long-run relationship between variables using the FMOLS and DOLS panel cointegration techniques

Variables		FMOLS		DMOLS	
Dependent	**Independent**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
EE	GHG	-0.16	0.05**	-0.28	0.00*
	RE	0.46	0.00	0.32	0.00*
	GI	0.71	0.00	0.72	0.00*
GHG	EE	-0.24	0.02**	-0.35	0.00*
	RE	-0.41	0.00*	-0.28	0.00*
	GI	-0.53	0.00*	-0.64	0.00*
RE	EE	0.35	0.00*	0.38	0.00*
	GHG	-0.3	0.00*	-0.26	0.00*
	GI	0.34	0.00*	0.37	0.00*
GI	EE	1.01	0.00*	0.98	0.00*
	GHG	0.57	0.33	0.68	0.56
	RE	0.53	0.00*	0.42	0.00*

*Note: * and ** represents significance at the 1% and 5% levels.*

Source: own work

The findings of long-run relationship analysis confirmed that both tests, FMOLS and DOLS, had similar results. The empirical results were statistical significance at 1% and 5% for analysed parameters, excluding two cases in DOLS and FMOLS models for greenhouse gas emissions' impact on green investment and vice versa. An increase of 1% of greenhouse gas emissions led to the decline of energy efficiency by 16% (FMOLS) and 28% (DOLS). At the same time, the increase in the share of renewable energy in final energy consumption by 1% provoked: an increase of the energy efficiency by 46% (FMOLS) and 32% (DOLS); a declinine of greenhouse gas emissions by 16% (FMOLS) and 28% (DOLS). What is more, the growth of green investment by 1% allowed: an increase of energy efficiency of the country by 71% (FMOLS) and 72% (DOLS); an increase of renewable energy by 34% (FMOLS) and 37% (DOLS); a decline of greenhouse gas emissions by 53% (FMOLS) and 64% (DOLS). The findings (Table 3) proved the hypothesis of the long-run relationship between selected variables. It allowed concluding that attracting green investment and extending renewable energy led

to a decline in greenhouse gas emissions and an increase in a country's energy efficiency. The findings of the Granger causality test are shown in Table 6.

Table 6. The empirical results of Granger causality test between the energy efficiency of a country, green investment, greenhouse gas emissions and share of the renewable energy in the final energy consumption

Null Hypothesis	Zbar-statistic	W-statistic	Probability	Confirmation	Type of causality
GHG→EE	2.72	2.03	0.04**	reject	Unidirectional causality from GHG to EE
EE→GHG	2.43	1.55	0.12	accept	
GI→EE	2.61	1.85	0.06***	reject	Bi-directional causality between EE to GI
EE→ GI	1.8	0.5	0.02**	reject	
RE→EE	4.89	5.63	0.002*	reject	Bi-directional causality between EE and RE
EE→RE	1.67	0.29	0.04**	reject	
GI→GHG	2.60	1.83	0.04**	reject	Bi-directional causality between GI to GHG
GHG→GI	1.17	0.55	0.06***	reject	
RE→GHG	3.68	3.62	0.0003*	reject	Unidirectional causality from RE to GHG
GHG→ RE	1.67	0.28	0.78	accept	
RE→ GI	2.57	1.78	0.03**	reject	Unidirectional causality from RE to GI
GI→ RE	1.55	0.08	0.93	accept	

Note: →– no Granger causality; accept or reject – mean the decision on null hypothesis;

, **, * – represent significance at the 1%, 5% and 10% levels.*

Source: own work

Thus, the findings in Table 6 confirmed that unidirectional causality was directed from greenhouse gas emissions to energy efficiency. Simultaneously, the unidirectional causality was confirmed from share of renewable energy in the final energy consumption to green investment and greenhouse gas emissions. Therefore, the empirical results confirm the bi-directional causality between: energy efficiency and share of renewable energy in the final energy consumption; energy efficiency and green investment; greenhouse gas emissions and green investment.

Summary, recommendations

The transition to the carbon-free economy under the "Green Deal Policy" justified developing the mechanisms and tools for increasing a country's energy efficiency. The bibliometric analysis results proved that a country's energy efficiency through the efficiency of the policy to attract green investment, extend renewable energy, and decline greenhouse gas emissions. The Granger causality test's findings confirmed the bi-directional causality between energy efficiency and the share of renewable energy in the final energy consumption. Moreover, considering the results of cointegration analysis (using DOLS and FMOLS), the increase of the share of renewable energy in the final energy consumption provoked an increase in the energy efficiency by 46% (FMOLS) and 32% (DOLS). The results of Granger causality test allowed to confir the unidirectional causality from greenhouse gas emissions to energy efficiency. Simultaneously, an increase by 1% in greenhouse gas emissions provoked a decline in energy efficiency by 16% (FMOLS) and 28% (DOLS). In this case, the government should implement effective instruments and policies to reduce air pollution. Besides, the stimulating policy on spreading renewable energy allowed an increase in energy efficiency and a decline in air pollution. The developing positive business climate allowed attracting the additional green investment for renewable energy and green technologies.

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Implementation of Cognitive Technologies in the Process of Joint Project Activities: Methodological Aspect

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Abstract: The article defines the technical and logical-structural conditions for ensuring joint project activity on the basis of cognitive technologies. An algorithm was developed to support the approval of the decision on the outsourcing of project works on the terms of system outsourcing. A fuzzy logic algorithm for selecting a contractor for specific works within a specific project and providing support for the execution processes is proposed. The experimental part of the cognitive model is investigated on the basis of additive convolution of evaluation indicators. The pattern of calculation of relative degrees of advantage of indicators for estimation of potential outsourcers is created.

Key words: project management, project contractor, outsourcing, cognitive technologies, neural network modeling, fuzzy procedures, convolution of evaluations

JEL: O14

Introduction

Today, project management, as well as change management, is an area of rapidly evolving systems of management theory, and the results of its studies are widely used in the practice of project management. The high speed of change of external conditions, increasing the requirements in the area of quality of execution of works and tasks, complexity of achieving the results of implementation of projects lead to the fact that outsourcers are often involved in execution of the projects themselves, which leads to a search for new methods and practical algorithms of highly efficient and intelligently secured combination of the main project executor ("participant 1") and outsourcing firms ("participant 2").

The modern practice of joint project activity is increasingly inclined to using cognitive technologies based on the introduction of neural networks that can improve the organizational and technological efficiency and accuracy of interaction of "participant 1" and "participant 2".

The complexity of making a decision to outsource works is justified in the studies: [Atkinson, 1999; Anbari et al,. 2008; Badewi, 2015; Ferreira & Otley, 2009; Turner, 1999; Bogachov et al., 2020; Dalevska et al., 2019; Dementyev & Kwilinski, 2020; Dzwigol 2019; 2020; Dzwigol & Dźwigoł-Barosz, 2018; 2020; Dzwigol et al., 2020; Kaźmierczyk & Chinalska, 2018; Kharazishvili et al., 2020; Kuzior et al., 2019; Kwilinski, 2018a; 2018b; 2019; Kwilinski et al., 2019; 2019a; Kwilinski & Kuzior, 2020; Lyulyov et al., 2020; 2021; Melnychenko, 2019; 2020; 2021; Miskiewicz, 2020a; 2020b; Saługa et al., 2020; Tkachenko et al., 2019a; 2019b; 2019c; 2019e]. At the same time, it should be taken into account that the alternative of outsourcing or in-house service to perform the project works does not directly influence the effectiveness of the project implementation, and to a greater extent, the change in efficiency is mainly due to the factors that determine this alternative [Hubbard 1990, Wit 1988]. The advantages of outsourcing in project management and support of joint participation are as follows: 1) opportunity for "participant 1" to focus on the main works within the project; 2) transferring the problem of searching for highly specialized personnel and human-related risks to the side of "participant 2"; 3) distribution of project risks between several parties; 4) speed and flexibility of obtaining the necessary competencies without the need for a “bloated” personnel of executors within the framework of the project; 5) reducing the cost of maintaining the infrastructure required to organize the process of project development and support; 6) possibility of applying technological innovations without time and financial costs. Taking into account the highlighted advantages, we conclude that, ultimately, the effective use of project outsourcing can improve the quality of products and services to fully meet the needs of the customer, while reducing costs and time to implement the project, as well as releasing resources for the highest priority areas of development.

At the same time, the use of outsourcing is associated with a number of negative aspects, which "participant 1" is obliged to control and level: 1) possibility of losing control over the development and support of separate project works; 2) possibility of reducing competitiveness due to the loss of technical knowledge and motivation of executors;

3) increased level of information risk associated with the presence of additional users of the project information system [Chih & Zwikael, 2015; Kerzner, 1987]. It is just this dialectical approach to the problems that forms the targeted and actual direction of studies on leveling negative consequences in project management on the basis of outsourcing with the use of intellectual cognitive models.

Methodological Framework of the Study

In terms of developing the methodological framework of the study, we proceed from the proposition that the technological aspect of management and the intellectual need in support of each project makes it impossible to iterate the phenomena that take place in the process of their implementation. Apart from the condition of project implementation, the determining factor of the external environment, which is influenced by a large number of accounted and unaccounted factors, is the economic dynamics, which forms the irreproducible conditions in which the project is being implemented. All of this implies the need for a polymethodic consideration of the scientific problem presented by the following methods.

Interval-Probabilistic Method

According to this approach, observations are presented not as numbers but as intervals reflecting the range of possible values of the observed values in the environment of the implemented project. Thus, in the works [De Marco & Narbaev, 2013; Liou, 2011] it is shown that, as a result of observation, not the elements of the sample xj but the values yj=xj+εj, where, εj – errors of measurements, studies and experiments, get known. Then the statistical distribution that the specified observations are subordinated is not f(x) but f(y), which differ as follows: $N_f(x) = \sup\left| f(y) - f(x) \right|$ (supremum is taken from the set of possible values of the error vector). The use of this technique through extending probabilistic values to interval-probabilistic ones allows to weaken the assumption of the classical probabilistic-statistical approach, which makes it possible to use it reasonably in the absence of homogeneous statistical observations in project management [Dvir et al., 2006].

Fuzzy-Logical Methods

The use of this approach is the most appropriate in cases of high complexity of the object under study, its nonlinearity, complexity of formalization, and in situations where the sources of information are interpreted qualitatively, inaccurately or indeterminately [Caron et al., 2013; Thamhain, 2014]. The basis of fuzzy-logical methods of calculating uncertainty is the concept of fuzzy sets. Under the fuzzy set A in the ground set $X = \{x\}$, in the sum of pairs $A = \{\mu_A(x), x\}$, μA:X→[0,1] is a membership function of the fuzzy set. Whereas, the value of this membership function μA(x) for the element x∈X is called the measure of membership. Building membership functions is one of the main problems with the practical use of fuzzy sets. These methods can be either direct (assigning membership functions to a graph, table or formula) or indirect (statistical method, method of subtractive clustering, method based on expert estimates, parametric methods, etc.).

An important component of the fuzzy logic approach (method) is the notion of a linguistic variable that allows us to formalize fuzzy concepts of natural language [Afshari et al., 2014]. A linguistic variable is a set β={β,T,X,G,M}, where β is its name; T is a set of its values (terms), which are the names of fuzzy variables {α, Xα, A} (where α is the name of a fuzzy variable; A is a fuzzy set on the range of definition Xα); G is a syntactic procedure allowing to generate new terms; M is a semantic procedure allowing to convert terms that were generated by the syntactic procedure into fuzzy variables. At the same time, linguistic variables can be both numerical (then its term-set consists of fuzzy numbers) and non-numerical, which allows to reflect both physical (quantitative) and linguistic (qualitative) uncertainty.

Evaluation of Alternatives in Case of Additive Evaluation Indicators

Suppose we set n alternatives Ai, i=1,n, which should be evaluated by m indicators xj, j=1,m, and the relative importance of each of them is set by a coefficient, wj, j=1,m. If these indicators are additive, then a weighted estimate of the i-th alternative is calculated by the formula:

$$R_i = \frac{\sum_{j=1}^{m} w_j R_{ij}}{\sum_{j=1}^{m} w_j} \quad (1)$$

where:

Rij is the estimate of the i-th alternative using the j-th indicator. If the estimates are normalized, the following formula is used:

$$R_i = \sum_{j=1}^{m} w_j R_{ij} \quad (2)$$

Since the estimates are fuzzy numbers, for the purpose of implementing the operations of multiplication and summation, it is required to use the above formula in accordance with one of the methods of fuzzy arithmetic and soft computing, particularly the interval method or based on the principle of Zadeh fuzzy generalization. If the estimates are expressed as triangular or trapezoidal numbers, then the algebraic summation will also result in triangular and trapezoidal numbers, respectively, and in the general case, a fuzzy arbitrary number becomes the result of multiplication and division. After calculating the weighted estimates Ri it is required to compare the alternatives Ai based on them. For this purpose, different methods of ordering of fuzzy numbers are used [Cicmil and Hodgson, 2006]. The alternative that ranked first in the ordered set is considered to be the best one.

Fuzzy Logic of Processes

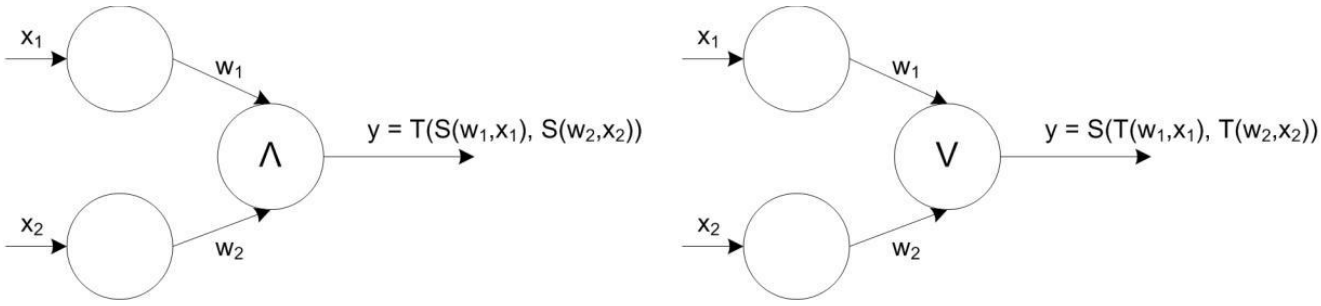
The system of fuzzy inference is “the process of obtaining fuzzy conclusions about the required control over an object based on fuzzy conditions or preconditions, which are information about the current state of the object” [Carnall, 2007]. At their core, the systems of fuzzy inference have a knowledge base that is formed by experts in the subject area and is intended to formalize their empirical knowledge in the form of a set of fuzzy cognitive rules as follows: (i): Q,P,A→B,S,F,N, where (i) is the name of a fuzzy product; Q is the area of its application; P is the condition of applicability of its core; A→B is the core of a fuzzy product where: 1) A is the condition of the core (LHS), 2) B is embedding of the core (RHS), 3) → is the designation of a logical implication operation; S is method of determining the quantitative value of the degree of truth of the core creation; F is the confidence factor of a fuzzy product; N are post-conditions of project implementation [Coppin, 2004].

Core $A \rightarrow B$ is the central component of the system of fuzzy inference and is generally presented as a fuzzy predicative rule of the form: Pi. If x is 1, then y is i, where x is an input variable, y is an output variable, A and B are functions of a device defined on x and y, respectively. The procedure of logical inference usually consists of the following main steps: introduction of fuzziness (fuzzification), aggregation of the degree of truth of preconditions of rules, activation of conclusions of rules, accumulation of the activated conclusions of rules and bringing to crispness (defuzzification). At the same time, the components of fuzzy models can have different implementation and the choice of specific implementation of one of the components often determines the choice of all other components.

Method of Neural Network Modeling

Artificial neural networks have their own limitations related to the inability to input the a priori information and the complexity of analysis of learning of such networks. These premises provide the basis for the framework of hybrid neural networks allowing to obtain the result based on a system of fuzzy inferences, and the parameters of these systems are tuned using the algorithms of neural network learning [Anbari, 2003; Russell and Norvig, 2016]. A hybrid neural network implies a neural network with clear signals, weights and activation function, but with the implementation of aggregation and activation operations using t-norm, t-conorm and other continuous operations. Hybrid networks are based on the concept of fuzzy neurons. The structure of fuzzy neurons "AND" and "OR" is presented in Fig. 1.

Figure 1. Structure of Fuzzy Neurons "AND" and "OR"



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When using the neuron "AND", the following approaches can be used to implementtriangular norm operation: min–conjunction, algebraic formation, boundary

formation, drastic multiplication of truth of preconditions of rules, etc. When using the neuron "OR", the following approaches are usually used to implement triangular norm operation: max –disjunction, algebraic sum, boundary sum, drastic sum of weights of truth of preconditions of rules.

Main Findings

Algorithm for Support of Approval of a Decision on Outsourcing of Project Works (System Outsourcing)

In case of technological and economic necessity, priority areas of “selective outsourcing” or “integrated outsourcing” should be selected, and at the same time, the task of evaluation of the expediency of outsourcing specific project works [Hatfield, 1995] becomes relevant. We reduce this problem to solving the task of multicriteria binary classification: depending on the results of the evaluation of the task using a set of indicators, it is required to refer it to one of two classes, that is, to perform a mapping such as $f(R): R \to Y \in \{C_1, C_2\}$, where C1 is the class of works for which outsourcing is inappropriate, C2 is the class of works for which it is advisable to involve third party executors [Ofer and Jack, 2019; Vakola et al., 2004]. The authors suggest the following set of indicators of such classification:

1. Impact of a work on information security of the project customer (z_1):
   - the amount of losses as a result ofthe unavailability of work-related project services (z1,1), USD;
   - the amount of losses as a result of the violation of data integrity through the use of work-related project services (z1,2), USD;
   - the amount of losses as a result of the violation of data privacy through the use of work-related project services (z1,3), USD;
2. Technical and economic characteristics of design works (z_2):
   - term of performance of work by own efforts ($z_{2,1}$), days;
   - term of performance of work involving outsourcing ($z_{2,2}$), days;
   - cost of performance of work by own efforts ($z_{2,3}$), USD;
   - cost of performance of work involving outsourcing ($z_{2,4}$), USD;
   - number of actions ($z_{2,5}$) that are blocked by a task, units

3. Rating of a potential third party contractor of project works (z_3).

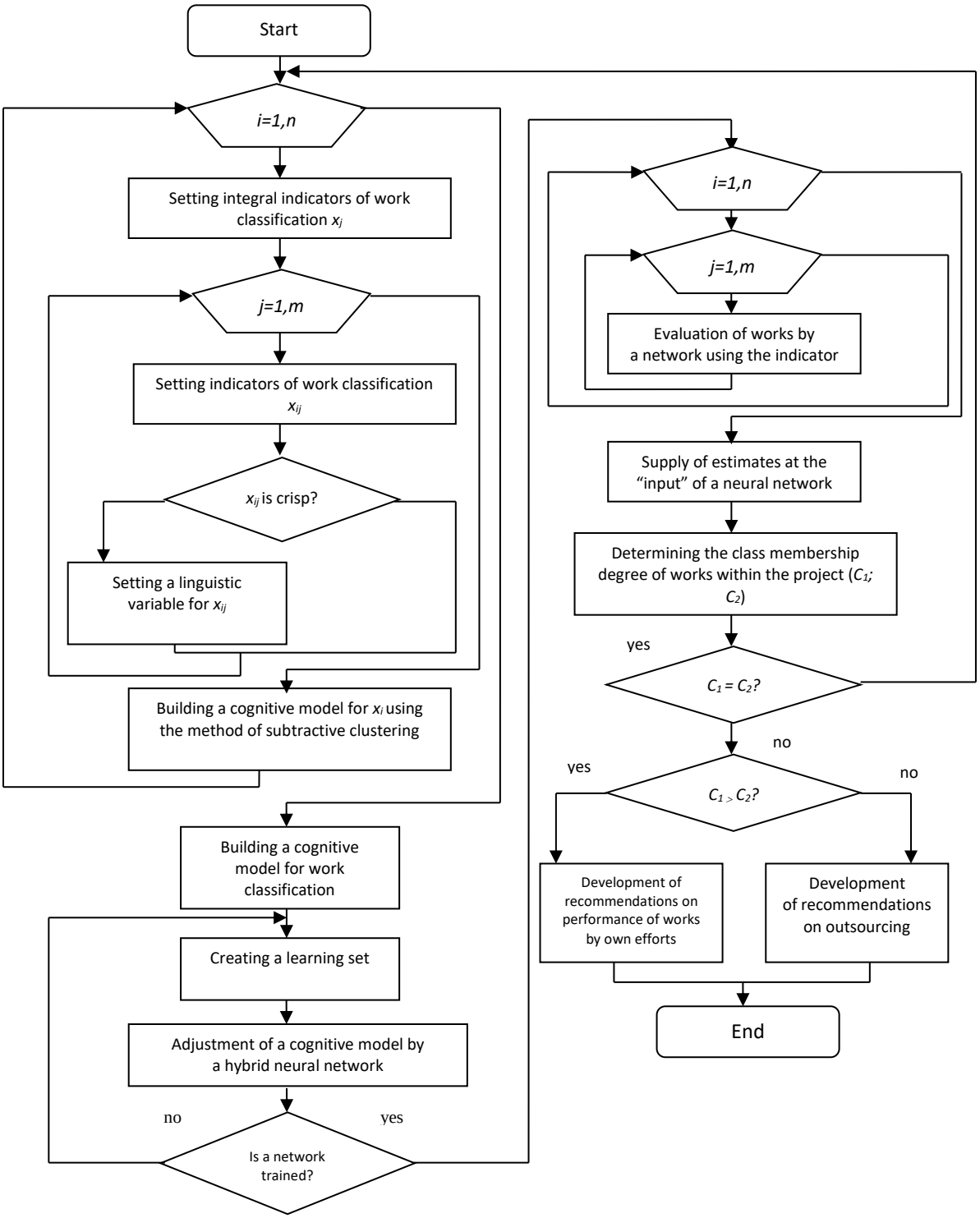
4. The readiness of the main contractor to perform project works independently (z_4):

- number of similar works already performed by the contractor personnel ($z_{4,1}$), units;
- proportion of employees with an academic degree on the staff ($z_{4,2}$), units;
- proportion of R&D expenses in revenue ($z_{4,3}$), %;
- average cost of previously completed projects ($z_{4,4}$), units;
- number of similar projects completed ($z_{4,5}$), units;
- compliance of processes with policy subdivisions and information security standards ($z_{4,6}$), units; linguistic estimate;
- availability of necessary infrastructure and tools ($z_{4,7}$), linguistic estimate;
- level of knowledge of necessary technologies ($z_{4,8}$), linguistic estimate;
- skill level of the engineer team ($z_{4,9}$), linguistic estimate;
- relevance of technological and instrument stack used ($z_{4,10}$), linguistic estimate;
- prevalence of review practices and result audit ($z_{4,11}$), linguistic estimate;
- stability of the use of automated tools for quality assurance of project works ($z_{4,12}$), linguistic estimate.

The use of the proposed set of indicators suggests that a potential third-party contractor (outsourcing firm) has already been selected [Eduardo et al., 2015]. The authors propose an algorithm for estimating the feasibility of outsourcing specific works within the project, a block diagram for which is presented in Fig. 2.

In the current practice of project management, a large number of algorithms for classification of compositions of project works is used, but most of them have a significant drawback – they work on the principle of "black box", that is, an attempt to explicitly interpret the patterns leading to the object attribution to one of the classes, and this results in some difficulties [Turner & Muller, 2003].

Figure 2. Block Diagram of a Cognitive Algorithm for Evaluating the Feasibility of Outsourcing Project Works



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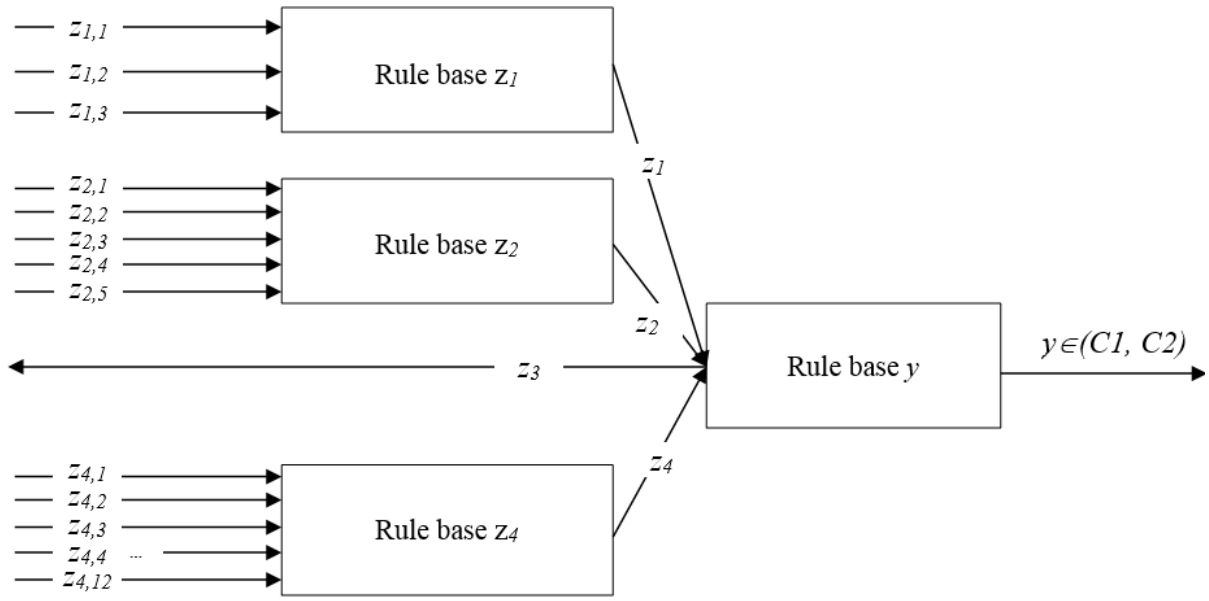
The classifiers based on cognitive models of knowledge representation, which underpin the rule base, are devoid of this drawback. Given that the works within a particular

project are usually unique and specific, the authors conclude that the "accurate" estimate of $z_{1,1}$–$z_{1,3}$, $z_{2,1}$–$z_{2,4}$, is difficult, and the use of probabilistic methods to remove uncertainty is complicated by a lack of relevant static information to confirm a specific distribution law. The indicators $z_{4,6}$–$z_{4,12}$ have a qualitative nature and do not have a physical measurement scale [Einhorn et al., 2019].

Considering the above, the authors conclude that the rules of classification of the cognitive model should be fuzzy. The systems based on fuzzy inference work effectively even in situations where obtaining information is fraught with various difficulties and parameters and input data are not accurate and properly represented [Zwikael and Smyrk, 2011]. In this regard, it is suggested that an approach based on a fuzzy rule base can be used to evaluate the appropriateness of outsourcing the project [Freeman and Beale, 1992]. The structure of the cognitive model proposed by the authors to evaluate the feasibility of outsourcing a project is presented in Fig. 3. As we can see, a hierarchical structure is used. For integrated indicators, their own knowledge bases are created, which outputs are supplied at the input of a higher level knowledge base.

Figure 3. The Structure of a Cognitive Model for Evaluating the Feasibility of Outsourcing a Project



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Such approach makes it possible to overcome the "curse of dimension" as the number of fuzzy rules contained in the base is significantly reduced. In the first stage of designing

a hierarchical system of fuzzy inference, it is required to specify the structure of a base of fuzzy lower-level cognitive rules. It is often difficult for a project manager to manually create rules as the range of definition of input variables is limited by the knowledge of the manager, and a large amount of input data leads to combinatorial explosion of the number of rules in the base. One such combination method is the method of subtractive clustering of experimental data, which is characterized by relative ease of use and the availability of software implementation [Fuchs et al., 2016]. In addition, as a result of using this method, rules that correspond to the areas of greatest concentration of data are generated, which eliminates the problem of combinatorial explosion and makes a fuzzy system more transparent for "participant 1" and "participant 2" within a separate project [White and Fortune, 2002]. Each center of the cluster V_1, V_2,….V_n found as a result of clustering where $V_i = (z_1, z_2, ..., z_m, y); i = 1..n$ is matched with a fuzzy rule of the type: $Rule(i): If \left\{ z_1 \_ near \_ z_i^* \right\} then \left\{ y_1 \_ near \_ y_i^* \right\}$.

Membership functions are obtained through the process of designing the membership degrees of a respective cluster on the axis of variables, after which a set of membership degrees is approximated by the corresponding functions. As a result, we obtain the rules of a more conventional form:

(3) $$Rule(i): If \_ z_1 \_ is \_ A_{i1} \_ and \_ z_2 \_ is \_ A_{i2} \_ then \_ y \_ is \_ B_i$$

where:

– $z_j, j = 1..n$ are input system parameters; *y* is an output variable;

$A_{i,j}, B_i$ are membership functions of fuzzy sets defined for z_j, and *y,* respectively.

As a result of applying this transformation to the centers of all the clusters found, a knowledge base of a lower-level fuzzy system of inference is created within the project works. For the lower level of the hierarchy (which rule inputs are components of integral criteria), the rules will look as follows:

(4) $$Rule(j): If \_ z_{i1} \_ is \_ A_1 \_ and \_ z_{i2} \_ is \_ A_2 \_ and ... and \_ z_{ik} \_ is \_ A_k \_ then \_ z_j \_ is \_ B_j$$

where:

$z_{i,k}$ – *k*-th criterion of *i*-th group of criteria of classification of project works;

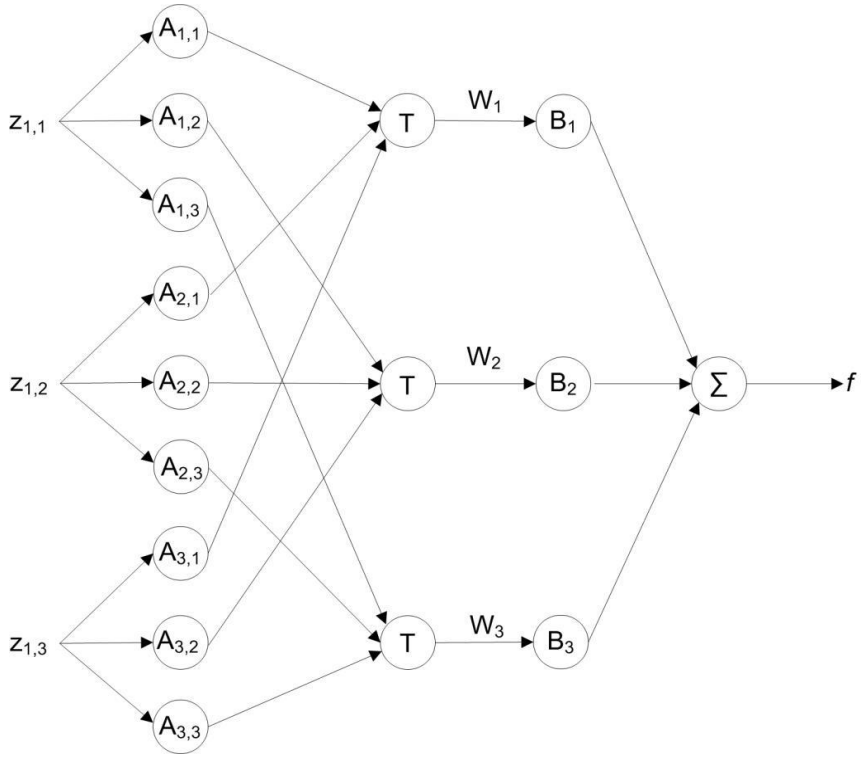
$z_{,i}$ – integral criterion of *i*-th group;

A_k – membership function defined for $z_{i,k}$;

B_j – membership function defined for x_i.

The method of subtractive clustering, despite its advantages, often builds suboptimal membership functions and does not have the ability to adjust the weights of rules. One of the most common optimization methods is to use hybrid neural-fuzzy networks [Schmidhuber, 2015]. The essence of this method is to build a neural network, which is isomorphic to the rules of the knowledge base, and its further learning. For the rules of Mamdani type, the M-ANFIS architecture of a hybrid neural-fuzzy network is generally used [Wauters and Vanhoucke, 2015]. The fragment of a network for the base of rules for the integral criterion "Impact of a work on the terms of performing a project as a whole, taking into account the activities of the outsourcer" is presented in Fig. 4. (the structure is similar for the other criteria).

Figure 4. Fragment of a Hybrid Neural-Fuzzy Network for the Criterion "Impact of a Work on the Terms of Performing a Project as a Whole, Taking into Account the Activities of the Outsourcer"



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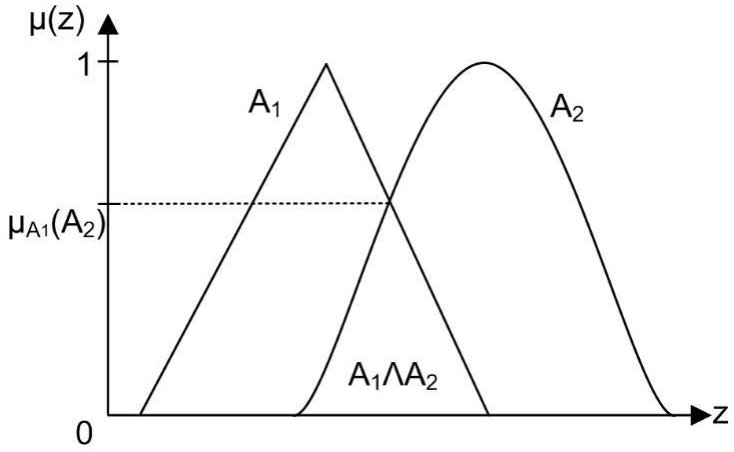
The first layer of this network implements the fuzzification operation. The node outputs of this layer are the values of the membership functions at the given input values: $O_{1,i} = \mu_{Ai,j}(z_i)$.

It should be noted that in the case of using fuzzy input data, the membership degree of input data is a marker of the membership of one fuzzy set in another set and is calculated as the height of intersection of these fuzzy sets, which is illustrated in Fig. 5.

Figure. 5. The Calculation of the Membership Degree of Fuzzy Input Data When Evaluating the Feasibility of Outsourcing Project Works



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The second layer implements the rules of a fuzzy system. Its outputs are the degrees of activation calculated using the T-norm: $O_{2,i} = w_i = \mu_{A1,j}(z_1) \wedge \mu_{A2,j}(z_2) \wedge ... \wedge \mu_{An,j}(z_n)$.

The third layer performs an implication operation $O_{3,i} = w_i \circ C_i$. The fourth layer performs the aggregation operation $O_{4,i} = \sum w_i \circ C_i$. The fifth layer implements the defuzzification of the output of the previous layer (usually based on the center of gravity method).

As a result of the learning of a hybrid neuro-fuzzy network, the parameters of membership functions are modified, which improves the quality of the system of inference when performing the project works. In addition, using the method of back propagation of error, you can adjust the appropriate weights of rules, which also has a positive effect on the quality of the model of cognitive project management [Ashurst et al., 2008].

Hybrid neuro-fuzzy networks for other integral criteria are built and trained in the same way. As a result, the outputs of these networks are supplied at the input of a higher-level rule base. The process of generating the rules of a higher-level knowledge base is similar to that process for the lower levels, but in this case the Sugeno algorithm of fuzzy inference is used [Deco and Schermann, 2000]. Each center of the cluster is matched with a rule of the type:

(5) $$Rule(j): If\ \_z_1\_is\_A_1\_and\_z_2\_is\_A_2\_and...and\_z_n\_is\_A_n\_then\_y\_is\_C_m$$

where:

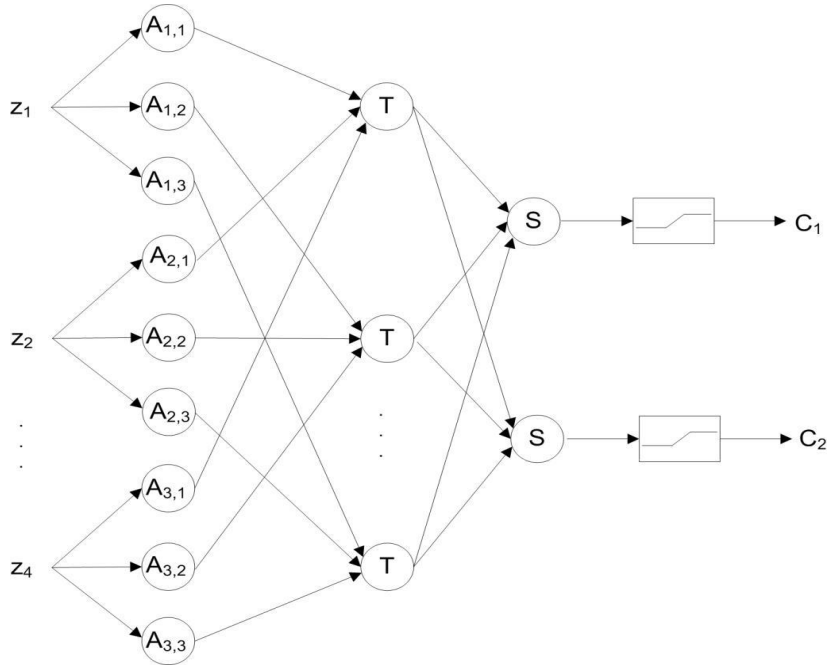
z_n – integral criterion of classification of project works;

A_n – membership functions z_n;

y – membership of a project work in a class (C_1. C_2).

As a result of applying this transformation to the centers of all the clusters found, the knowledge base of a fuzzy system of inference is created. One of the most well-known methods for optimizing the rule base in classification tasks is a hybrid neuro-fuzzy classifier [Jin et al., 2017]. The basic node of the network for the task of classification of works within a project is presented in Fig. 6.

Figure 6. Hybrid Neuro-Fuzzy Classifier of Works within a Project



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The first layer of the hybrid neuro-fuzzy classifier performs a defuzzification procedure, giving at the output the degrees of the membership of input variables in the respective fuzzy set A_{ij}. The neurons of the second layer, while implementing the operation of the T-norm, calculate the degree of activation of fuzzy rules. The neurons of the third layer perform a weighted summation of the degrees of activation of rules, and the fourth layer, based on the activation functions of the sigmoid type, calculates the degrees of membership of the object in one of the two classes [Jang, 1992]. The result of network learning is optimized membership and weight functions of cognitive rules.

The algorithm developed to support the approval of a decision on transferring separate project works on the principles of outsourcing and based on the analysis and classification of these works differs from the known ones by the application of such classification criteria as the impact of specific outsourced work on the system and reliability of the outsourcer, as well as the presentation of work characteristics in the form of antecedents of a hierarchical fuzzy-logical cognitive base of rules with further tuning of its parameters with the help of a neural network to take into account the tendencies of development of a project participant as an economic system [Globerson and Zwikael, 2002; Lin et al., 2019]. The application of the above algorithm as a tool of managerial activity makes it possible to increase the economic efficiency of project implementation through the involvement of responsible outsourcing structures.

Fuzzy-Logical Algorithm for Selecting a Contractor for Specific Project Works

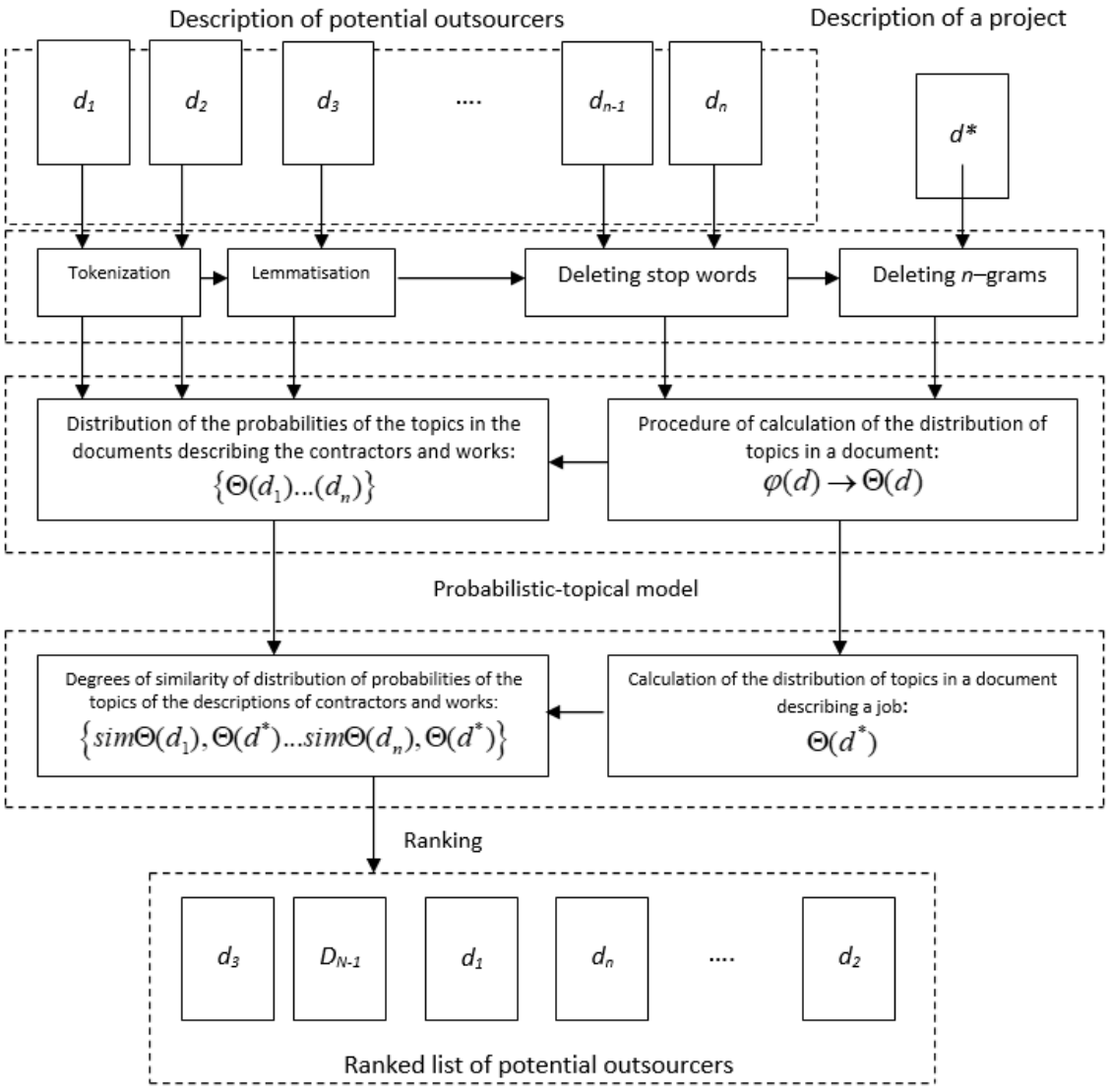
The evaluation of the feasibility of outsourcing a project work involves the analysis of a potential outsourcer, and in the case of a decision on outsourcing, it is required to make a final choice. The authors suggest a cognitive algorithm of a fuzzy-logical procedure for selecting a third-party contractor for specific project works based on topic modeling technology to implement preliminary filtering of possible third-party contractors within a specific project (Fig. 7).

Probabilistic case models allow to work with documents described in the natural language of algorithms. This allows these models to be applied without the need for prior intelligent data processing. Thus, it was concluded that text descriptions of contractors and tasks (d_1,…,d_n) are divided into semantically different components – 1) "title", 2) "basic

content", 3) "initial potency", respectively. To account for the specificity of each component (length, "noisy" background words), it is advisable to separate them at the input of the model, which was implemented by distinguishing three modalities in the topic model. In this case, the specificity of the components is taken into account by specifying a separate matrix of cognitive terms for each modality [Naeni et al., 2011; Shenhar & Wideman, 2000].

The disadvantage of probabilistic topical models is their fragmentary nature and algorithmic instability. One of the ways to solve this problem is through regularization [Pajares et al., 2011]. From this point of view, the approach of building topical models based on additive regularization is of the greatest interest.

Figure 7. The Procedure for Preliminary Filtration of the Set of Possible Third-Party Contractors of a Project



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This approach is about superposition on the search for solution of additional constraints, each of which is formalized as a regulator of the optimization criterion $R_i(\Phi,\Theta) \to \max$, where Φ is a matrix of topic terms; Θ is a matrix of document topics. The weighted sum of such criteria $R(\Phi,\Theta)$ is maximized together with the basic plausibility criterion. The advantages of this approach include the simplicity of the mathematical methods, generalization of most known approaches, presence of software implementation. In view of the above, for preliminary filtering of the set of possible subcontractors of the project, the authors suggest to use additive regularization of topical models, and for selection of a regularization strategy, it is proposed to maximize the weighted normalized sum of internal criteria of quality of the topical model [Munns and Bjeirmi, 1996; Shipley and Johnson, 2009].

The result of building a topical model is a matrix $\Theta(\Theta(d_1))...\Theta(d_n)$, which describes the distribution of topics by documents (textual descriptions of potential contractors), as well as a function $\varphi(d^*) \to \Theta(d^*)$, which allows to distribute topics in a new (not involved in the building of the model) document *d**. Given this, the task of the preliminary filtration of a set of outsourcers are reduced to finding a set of documents $(d_1),...,(d_n)$, which describes third party contractors, for which the distribution of topics is similar to the distribution of topics in a document describing the specific work of the project, i.e., documents, whose vectors $(\Theta(d_1))...\Theta(d_n)$ are similar to the target vector $\Theta(d^*)$. After that, they should be ranked according to the degree of similarity, i.e., it is assumed that more similar documents are more relevant and should be displayed at the beginning of the list of recommendations within the performance of project works [Shenhar et al., 2001].

There are many known ways to determine the degree of similarity of vectors in a multidimensional space (Euclidean metric or distance, Manhattan distance, etc.). The general problem of estimating the proximity of vectors is the "curse of dimension" – in the case of a recommended system, for one target document, it is required to calculate the metric *n* times (*n* is the number of documents in the database excepting the target document). Particularly urgent problem arises in the conditions of intensive entry of requests for the development of project recommendations – in this case, the number of necessary calculations of the degree of similarity is determined by the formula:

(6) $$C_n^2 = \frac{n!}{[2(n-2)!]}$$

where:

n is the number of documents in a collection.

One of the options to reduce the criticality of this problem is to use an inverted index, which is about storing a set of documents for each topic, where the probability distribution of the topic is positive, in the stage of creating a matrix *Θ*. When making recommendations for the *d** document, only those documents that are contained in the inverted index in those positions for which the probability distribution in the *d** document is positive are selected. Due to the fact that in the process of regularization the matrix *Θ* is getting very thin, the number of calculations of the degree of similarity is significantly reduced (Wang, 2009). In spite of this, the amount of computing required can be large enough (for complex projects). In this regard, it is proposed to select in the inverted index for a topic only those documents, where the probability of this topic is higher than the average value.

(7) $$\Theta(d_1) \succ \sum_{j=1}^{n} \frac{\Theta(d_1)}{n}$$

where:

$_i$ – *i*-th document of a collection;

$\Theta(d_1)$ – probability value of a topic in the document $_i$;

– number of documents in a collection.

It is advisable to calculate the average probability values for topics once in the learning process, in which case the use of this criterion will not affect the computational complexity of the algorithm for calculating similarities within the project.

To evaluate the similarity with the target document, the authors are asked to select documents only from the topics whose probability in the target document is higher than the average probability value in this document. Given that vectors $\Theta(d_1)$ are normalized to one, the mean probability is a constant and inversely proportional to the number of topics of the model: $\Theta(d_1) \succ 1/T$. Therefore, the application of this criterion does not affect the computational complexity of the algorithm for calculating similarity within a project [Zhang & Chen, 2018].

The application of the proposed selection methods allows to reduce the computational complexity of the algorithm for calculating the similarity of document vectors from the

database and the target document by reducing the number of required calculation operations. At the same time, excluding documents from a set of comparison does not have a significant negative effect on the quality of the recommendations, since only documents with a relatively low probability distribution of topics, which in the overwhelming majority of cases are not relevant to the target document, are excluded.

In spite of the availability of a great number of metrics for measuring the proximity of vectors in multidimensional space, the cosine degree of proximity is most commonly used. The cosine degree considers the attributes of the vector model to be independent and completely separate, although some topics in the model can often be similar to each other. In this regard, the authors suggest to use "soft" cosine degree for the calculation of similarity of the vectors of distribution of topics in documents, which takes into account the similarity between the topics (7):

$$soft\_\cos ine = \frac{\sum_{i,j}^{N} s_{ij} \times d_{1i} \times d_{2j}}{\sqrt{\sum_{i,j}^{N} s_{ij} \times d_{1i} \times d_{1j}} \times \sqrt{\sum_{i,j}^{N} s_{ij} \times d_{2i} \times d_{2j}}} \quad (8)$$

where:

s_{ij} – similarity between *i*-th and *j*-th topics;

d_{ni}– occurrence probability of *i*-th topic in the document d_n.

To calculate the similarity between the topics, it is suggested to use the cosine degree by distribution vectors of the terms in topics (8).

$$\cos ine(T_1, T_2) = \frac{\sum_{i}^{n} \Phi_i(T_1) \times \Phi_i(T_2)}{\sqrt{\sum_{i}^{n} \left[\Phi_i(T_1)\right]^2} \times \sqrt{\sum_{i}^{n} \left[\Phi_i(T_2)\right]^2}} \quad (9)$$

where *n* is the number of tokens;

$\Phi_i(T)$ – probability of the topic *T* for *i*-th token.

It is suggested to calculate the degree of similarity between the topics only once in the stage of model learning. In this case, the use of this criterion will not adversely affect the computational complexity of the algorithm for calculating the proximity of documents within a project.

Experimental-Modular Part of the Cognitive Model

Over time, the preliminary filtration model database is supplemented with new documents. It seems impractical to retrain the model with each occurrence of a new document – it will put a great strain on the computation system, and the impact of a single document on the structure of the model is estimated as negligible (Cioffi, 2005). In this regard, the authors suggest to retrain the model (including building an inverted index and calculating the degree of similarity between the model topics) using one of the following patterns: 1) periodically (for example, once a week); when theres accumulation of critical mass of documents (for example, 3-4% of the documents involved) that were not involved in building the model; 2) when the external quality criteria of the model are reduced.

As an experiment, there was built a model with 20 topics within the project, three of which are background ones. The regularization strategy was selected using the method of maximizing the weighted normalized sum of internal quality criteria (*D*). The selected strategy allowed to improve the internal quality criteria of the model, which is shown in Table 1.

Table 1. Internal Quality Criteria of a Cognitive Model

Modality	Criterion	No regularization	Optimal strategy	D, %
Title	Perplexity	222.88	280.15	26.13
	Proportion of background words	0.06	0.06	0.00
	Core contrast	0.96	0.99	3.13
	Core purity	0.46	0.57	23.91
	Sparsity of Φ	0.88	0.96	9.09
Basic content	Perplexity	1453.36	1748.12	20.28
	Proportion of background words	0.31	0.31	0
	Core contrast	0.97	0.98	1.03
	Core purity	0.18	0.22	22.2
	Sparsity of Φ	0.83	0.93	12.05
Initial potency	Perplexity	123.37	150	21.59
	Proportion of background words	0.04	0.04	0
	Core contrast	0.943	0.97	2.86
	Core purity	0.4	0.49	22.5
	Sparsity of Φ	0.83	0.94	13.25
Sparsity of Θ		0.03	0.84	2700

Source: own elaboration

As a control sample, 10% of documents were randomly selected from a total of 5,200 documents. Table 2 presents a comparison of the number of required calculations of proximity degree between document vectors calculated for each document of the control sample (using the proposed previous selection and without it).

Table 2. The Number of Required Calculations of Proximity Degree of Documents within the Cognitive Model of Selection

Criterion	Without previous selection	With previous selection	D, %
Mean	11,288	10,239	-9
Mode	4,495	3,632	-19
Median	9,653	7,288	-24.5

Source: own elaboration

Each document from the control sample was matched with a ranked list of recommendations from 10 documents. Experts were asked to evaluate the relevance of documents from the ranked list of the target documents using a binary scale (0 - not relevant, 1 - relevant). As a result, the score of each expert is a set of tuples like {(10 … 1), (00…1)…(10…0)}. The potency of a large quantity is equal to the number of documents in the control sample and the length of each tuple is equal to the length of the ranked list (in this case - 10). There were provided mean scores with respect to each marker. “Mean average precision at 10” appeared to be equal to 0.73 and “Mean reciprocal rank at 10” is equal to 1.74. This suggests that the mean precision of the first 10 documents is 73%, and at the same time, the project manager on average will likely find the first relevant document at the position 1.74 (certainly, the positions themselves are indicated by natural numbers).

Preliminary filtration of a set of contractors must result in a ranked list of outsourcers. After selecting the *top-N* outsourcers from the potential list (the value of *N* is determined based on the volume of resources of a project customer available for detailed examination), it is proposed to detail the information about them [Thomas and Mullaly, 2008]. In this stage, it seems appropriate to clarify the ability and interest of each outsourcer in performing the work, as well as to formalize the information needed for further evaluation of the characteristics of a potential outsourcer. The authors propose the following criteria for evaluating a potential outsourcer:

- number of joint projects (v1);

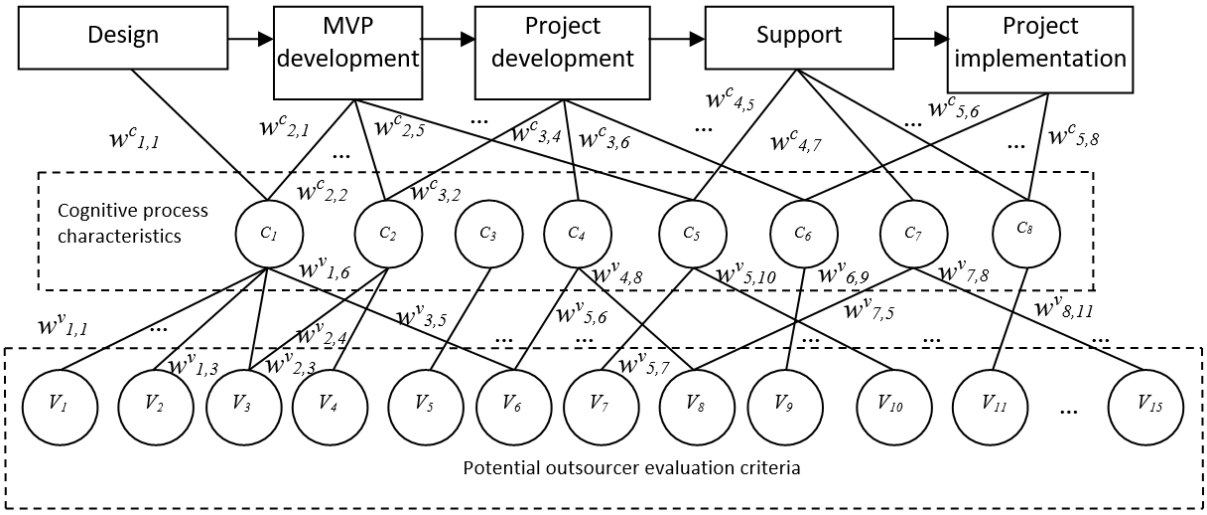
- number of similar works completed (v2);
- average cost of previously completed projects (v3);
- time of activity in the project services market (v4);
- proportion of R&D expenses in total revenue (v5);
- proportion of employees with an academic degree on the staff (v6);
- work completion time (v7);
- cost of performing certain works within the project (v8);
- contractor reputation (v9);
- openness of the process for the customer (v10);
- actuality of technologies and infrastructure used (v11);
- quality of services provided within the project (v12);
- transparency of contract conditions (v13);
- process compliance with information security standards (v14);
- financial stability (v15).

It is obvious that different stages of the life cycle of the project of development and support of works are dominated by certain characteristics that influence the process of making decisions on the use of project outsourcing, such as: the required quality of work delivery (c_1); criticality of observance of terms of work delivery (c_2); required level of information security (c_3); flexibility degree of the financial plan (c_4); frequency of progress control (c_5); frequency of changes to the specification of requirements within the project (c_6); amount of accumulated knowledge about the project system (c_7); proportion of "non-standard" innovative works (c_8), etc.

For example, at the stage of MVP (Minimum Viable Product) development, the quality of work is usually less important than at the stage of project development, and the amount of system knowledge accumulated increases as we move from stage to stage. In turn, the above characteristics influence the relative importance of evaluation criteria of potential third-party contractors [Sparrow, 2012]. So, the actuality of the technologies and infrastructure used is especially important in situations where high quality of work is required, and the presence of joint projects has a positive effect in situations where a large amount of system knowledge is available [Henderson, 2004]. The specified indirect influence

of a project stage on the relative importance of the evaluation criteria of third-party contractors creates a neural structure, the graphical model of which is presented in Fig. 8.

Fig. 8. Graphic Model of a Neural Network to Determine the Degree of Influence of a Project Stage on the Relative Importance of Criteria for Evaluation of Outsourcers



Source: own elaboration

Based on the analysis of this model, the weighting factor of the *i*-th criterion at the *k*-th stage of the project is proposed to be calculated by the formula:

$$w_{k,i} = \sum_{j=1}^{n} w_{k,j}^{C} \times w_{i,j}^{V} \tag{10}$$

where:

$w_{k,j}^{C}$ – importance of the *j*-th characteristic of the process of algorithm development in the *k*-th stage of the project;

$w_{i,j}^{V}$ – relative degree of importance of the *i*-th criterion when evaluating the *j*-th characteristic of the process of development of a control project algorithm.

To calculate the values $w_{k,j}^{C}$ and $w_{i,j}^{V}$, it is proposed to use the Saati method. This method is based on paired comparisons of the degree of dominance of objects on a scale of intensity from 1 to 9. The diagram of this process (using the example of criteria for evaluation of potential outsourcers) is presented in Table 3.

Table 3. The Diagram of the Process of Calculation of Relative Degrees of Dominance of Criteria for Evaluation of Outsourcers

Criterion	v_1	….	v_{15}	Proper vector	Priority vector
v_1		…	P_1 / P_{15}	$\alpha_1 = \left(\frac{P_1}{P_2}\right)...\left(\frac{P_1}{P_{15}}\right) / n$	α_1 / α
…	…	1	…	…	
v_{15}	P_{15} / P_1	…		$\alpha_{12} = \left(\frac{P_{15}}{P_1}\right)...\left(\frac{P_{15}}{P_{11}}\right) / n$	
				$\alpha = \sum_{i=1}^{15} \alpha_i$	α_{15} / α

Source: own elaboration

It seems appropriate to determine the degree of violation of consistency of estimates. This usually involves the consistency ratio calculated by the formula:

(11) $$OS = \frac{(1 - IS)}{CC}$$

where: *IS* – consistency index calculated by the formula:

(12) $$IS = \frac{\lambda_{\max} - n}{n - 1}$$

where:

$\lambda_{\max}$ – maximum proper number;

n - dimension of the matrix;

CC – random consistency (for a matrix with a dimension of 15CC equal to 1.59). If the consistency ratio is greater than 0.1, the estimates should be revised.

The above process must be iterated for each stage of the project life cycle.

Discussion

In continuation of this research area, it is possible to determine the analogy of evaluating the degree of importance of the considered and substantiated criteria when evaluating the characteristics of different stages of the project. As a result, there will be obtained weighting factors of the criteria for evaluation of potential outsourcers, which take into account the variable of relative importance of the criteria at different stages of the project.

Some of the proposed criteria for evaluation of potential outsourcers (v_9-v_{15}) have a qualitative nature and do not have a physical scale of measurement. As noted, it is appropriate to use linguistic variables for evaluation of such criteria. For these criteria, it is proposed to introduce a linguistic variable like $\beta_i=\{\beta,T,X,G,M\}$, $i=9:15$ (i is an ordinal number of the criterion) with triangular membership functions of terms and a range of definition [0,1]. Then, the result of the evaluation of each criterion (v_9-v_{15}) is a fuzzy triangular number corresponding to the term of the linguistic variable that it selected. Moreover, the "precision" evaluation of a number of proposed criteria (v_7-v_8) is complicated by the innovative nature of works, which makes it appropriate to use fuzzy numbers like $d=(d_1,d_2,d_3)$ for their evaluation.

Considering the above, it is suggested to use a fuzzy weighted additive convolution of evaluation criteria for evaluation of a potential third-party contractor:

$$r = \oplus \sum_{i=1}^{15} w_{k,j} \times \overline{v_i} \tag{13}$$

where:

r – contractor rating;

$\overline{v_i}$ – normalized estimate of i-th criterion.

Qualitative criteria (v_9-v_{15}) are normalized since the range of membership functions of terms of linguistic variables is [0,1]. The criteria (v_1-v_6) implement the dependencies like "the larger the value of the criterion, the more preferred is the contractor" and their estimates are generally "crisp". These criteria are normalized by the formula:

$$\overline{v_i} = \frac{v_i}{N} \tag{14}$$

where:

N is a number setting the upper limit of the criterion value (the maximum value of the criterion for the whole sample of outsourcers).

The criteria (v_7-v_8) implement the dependencies like "the smaller the value of the criterion, the more preferred is the contractor", and their estimates are expressed by "fuzzy" numbers. They are normalized by the formula:

(15) $$\overline{v_i} = (\frac{d_1}{M}, \frac{d_2}{M}, \frac{d_3}{M})$$

where:

M is the lower limit of the criterion (the minimum value of the criterion for the whole sample of outsourcers).

For convenience of the convolution, it is suggested to represent the values of "crisp" estimates of criteria (v_1-v_6) by a fuzzy triangular number like (*d,d,d,*), where «*d*» is a crisp value of the estimate.

The convolution result is also a triangular number expressing the integral estimate (rating) of a potential outsourcer. To select a potential outsourcer from the set of outsourcers, which were put in correspondence with the estimate at the previous stage, it is advisable to perform ranking using a triangular number. In this scientific work, we use the Jane method as a ranking method. According to this method, fuzzy estimates are normalized in accordance with the increase in the degree of their membership in a set of "big numbers" (15).

(16) $$Pos(r \in B) = \max_x \min(r, \mu_B(v))$$

where:

$B = (0,1,\infty,\infty)$ – "big" fuzzy number;

$\mu_B(v)$ – membership function.

It is advisable to conclude a contract, within which all aspects of the interaction are clarified and the contract for the delivery of a project work is signed, with an outsourcer that get the highest-ranking position as a result of the ranking. If during the negotiation stage it is found that the interaction with this outsourcer is inappropriate, it is suggested to repeat the procedure with outsourcers that took the lower ranking positions until a positive result is achieved.

Conclusion

In the scientific work, a methodological guidance was developed to identify and technologically substantiate the priority areas for application of outsourcing in project development and support. It was suggested to introduce a fuzzy-logical model for attracting third-party contractors, which will allow to determine the conceptual possibility before

delivering project works based on the analysis of the level of information risk of project implementation and the technical and economic competence of outsourcing firms. To estimate the advisability of transferring specific project works to third-party contractors when using the direction of “selective outsourcing” or “integrated outsourcing”, an algorithm was developed to support an appropriate managerial decision based on the analysis and classification of project works.

A cognitive algorithm is proposed to select executors for specific works in project development and support, which is characterized by the availability of preliminary filtration of a set of possible project co-executors based on probabilistic topical modeling of unstructured text documents describing opportunities for participation of outsourcers and selection of the types of potential works. The application of this algorithm allows to take into account the variable importance of the criteria for evaluation of executors at different stages of project implementation under the conditions of deficiency and inconsistency of information caused by the of nature of its implementation.

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Experience in ensuring the competitiveness of coastal regions in the European Union and all over the world

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Abstract: The article discusses the experience of ensuring the competitiveness of coastal regions in the EU and in the world. It has been established that socio-economic processes in coastal regions play a key role in ensuring their competitiveness on a global scale. The research is based on the description of experience according to the structural elements of competitiveness - “territory”, “people”, “business processes”, “administration”.

EU initiatives address key priorities for enhancing regional capacity for innovation, competitiveness, sustainable jobs, conditions that create growth for institutional, financial and regulatory support for regions, and Smart specialization strategies for regions aimed at increasing added value, building on regional competitive advantages and developing interregional cooperation.

Considering the world experience of management of the maritime sector, it is necessary to note the effectiveness of the use of incentives. Among them there can be found economic (fisheries and aquaculture, biotechnology and marine shelf research), recreational, energy and shipbuilding, logistics, educational, ecosystem and environmental activities.

1. It should be noted that the existence of a clear EU blue growth strategy, marine development strategies (subordinate to the EU regional development strategy) allow local and regional authorities to use existing tools to create highly skilled jobs and economic opportunities in the maritime sector (taking into account the specifics of each region). Noteworthy are the strategies of smart-specialization and high-tech sectors that require some education, skills and experience of specialists (biotechnology, research of the sea shelf with the help of robotics, etc.) 2. The functioning of maritime clusters is an example of an effective way to integrate maritime and related industries, promote international trade, increase the region's added value, increase employment in the region, improve staff skills, develop and improve technology. 3. The growth of value added in the maritime sector depends on the level of development of regional infrastructure and related sectors. A clear example of the creation of a regional ecosystem in the region is the Oslo Maritime Region, which, through the use of three principles - infrastructure, digitalization and science - has become one of the EU’s leading regions in terms of added value in the economy.

Key words: competitiveness, coastal regions, maritime sector, regional infrastructure

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Introduction

Problems of development of coastal areas and areas washed by ocean waters are in the field of view of scientists from around the world. The protection, conservation and development of the ecosystem of rivers, seas, oceans and similar areas on all continents of the globe is an important task of many global and regional organizations, including: Intergovernmental Oceanographic Commission, International Maritime Organization Global Ocean Forum, ULI Americas, European program INTERREG, The National Coastal Zone Management Program in the United States, The Canadian International Development Agency, Greenpeace, International Union for Conservation of Nature.

Creating a favorable economic and social environment in coastal regions for infrastructure development, foreign investment, increasing employment, reducing migration, simplifying logistics and commerce, developing education and culture creates the preconditions for the regions to function as ”living laboratories for testing new economic, medical, educational and environmental solutions” [Mikhaylov, 2019]. Effective management of the coastal region through the use of local and national policy instruments in order to stimulate innovation and their dissemination adapts the flexible economies of the coastal regions to integration with the global requirements of market systems.

Theoretical premises

The need to develop a common vision for the sustainable use of the resources of coastal regions based on the ecosystem approach in order to increase their competitiveness requires studying the experience of the EU countries and the whole world.

The purpose of the article is to generalize and systematize world’s experience, in particular, the experience of EU countries, which will allow other countries that have access to the seas and oceans to form their own strategies for the development of coastal regions, taking into account the current trends of developed countries. It is also necessary to outline the possibility of solving global world problems through an ecosystem approach to the use of resources that are available to coastal regions. It is these resources that form the preconditions for increasing the competitiveness of these regions.

The work of scientists from all over the world is devoted to the study of the features of the economy of coastal regions. G. Pontecorvo [Pontecorvo, 1989] claims the significant

contribution of the ocean sector to the US economy. Despite the fact that the publication dates back to the end of the last century, the close attention of the world community to the use of the resources of the seas and oceans began only from the beginning of the 21st century. Hance D. Smith [Smith, 2001] even claims the so-called "industrialization" of the world's oceans.

The study of the role of the maritime sector in the development of the economy allows you to develop strategies to increase both regional and national competitiveness [Morrissey, 2012].

Robert Costanza [Costanza, 1999] raises questions about the importance of the world's oceans and seas, and about limiting the use of their resources, using an ecosystem approach to sustainable development.

Methodology

The research methodology is based on the collection and processing of information by a descriptive method. The study of the need for the creation of marine protected areas required the use of deduction and induction methods. The study of the experience of using the tools to achieve the competitiveness of coastal regions was carried out using analysis and synthesis.

Results

Foreign experience in ensuring the competitiveness of coastal regions is systematized by the above components of competitiveness.

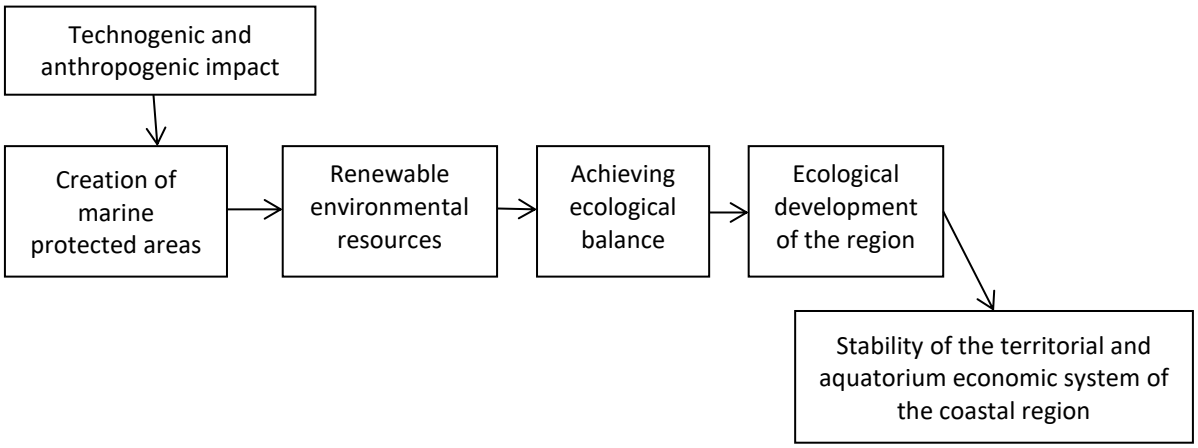
Marine Protected Areas (MARs) are a global conservation and management tool to increase the resilience of interconnected socio-ecological systems in order to conserve biodiversity and provide ecosystem services for sustainable use.

As the number of marine protected areas in the world grows rapidly, from 5% in 2005 to 10% in 2016 of the world's total water resources, there is an equal need to increase efforts and provide incentives for their effective management in order to conserve biodiversity with their help [Costello, Ballantine, 2015]. To this end, The IUCN Green List of Protected and Conserved Areas (GLPCA) has been established, a voluntary global standard according to which protected areas and their institutions can undertake to act in this direction and

cooperate with international organizations [Wells, Addison, Bueno, Costantini, Fontaine, Germain, Lefebvre, Morgan, Staub, Wang, White, Zorrilla, 2016].

Ecological management and conservation of marine wildlife populations is one of the most important tasks of coastal regions management. [Giménezm, Louis, Barón, Ramírez, Verborgh, Gauffier, Esteban, Eljarrat, Barceló, Forero, Stephanis, 2017]. Recent research demonstrates the critical and ongoing need to build the capacity of marine reserves to protect coastal and marine ecosystems. The development needs of coastal areas depend on the location of the territory, understanding the consequences and determining appropriate approaches to management and construction of system-wide monitoring and evaluation programs. Schematically, the causes and results of environmental activities are shown in Figure 1.

Figure 1. The need to create marine protected areas



Source: own work

In order to ensure the competitiveness of human resources, the Singapore Maritime Cluster Fund, established by the Maritime and Port Authority of Singapore, promotes the growth of maritime cluster networks in Singapore by supporting employment, business development and productivity of the Singapore economy.

The development and improvement of the labor skills of the Singapore Maritime Cluster workforce has been identified as one of the key initiatives for state support for the cluster by the Maritime Cluster Foundation. The program consists of the following initiatives [Maritime cluster fund]: trainings (the goal is to improve the knowledge and experience of local maritime personnel by attending training programs approved by the

Maritime Cluster Fund); encouraging companies to invest in skills and experience; encouraging maritime and industry associations to adopt a structured human and training infrastructure, tools and processes to attract, train and develop staff talent.

The European Commission is implementing a strategy to increase employment in the coastal and maritime tourism sector. In Europe, the tourism sector employs more than 3.2 million people and generates a total of € 183 billion in gross value added and accounts for more than a third of the EU's maritime economy. For example, 51% of hotel rooms across Europe are concentrated in regions with a sea border. The scientific potential of Oslo, represented by a university connecting the University of Oslo, the Oslo Science Park, the University Hospital of Oslo, the SINTEF Research Institute and surrounding areas, was opened in August 2020. It is the second place in terms of GDP per capita in Europe, which makes Norway an extremely productive country.

The regional competitiveness of the EU's coastal economic systems and processes is confirmed by the maritime technology sector's turnover of € 91 billion, which directly provides more than 500,000 jobs, most of which require highly skilled workers. The EU maritime technology sector creates at least as many additional jobs and contributes significantly to regional development (200 regions in 18 EU countries). [Blueprint For Sectoral Cooperation on Skills. Maritime Technologies, 2017, P. 12]

Coastal regions have their own specifics of directly related to the ocean industries. Many economic activities, such as maritime transport, oil and natural gas production, fisheries, tourism, seabed resource development, port activities and renewable energy are directly dependent on the state of the seas. The stability of the marine environment is the main prerequisite for the success and competitiveness of these industries. In turn, on these sectors of the economy depends development of other sectors that provide the very possibility of conducting sea-related economic activities [Fedorov, G., Mikhailov, A., Kuznetsova, T., P. 7-27]. An interesting interpretation of the international practice of coastal zone management is presented in the work of S. Fadeev, where the coastal zone is defined as a special hierarchical economic and geographical object [Makhnovsky, D., 2014. P. 50-66].

Since 90% of international trade is through seaports [Mikhaylov, A, 2019. P. 29-42], then on a global scale, the infrastructure tends to the coast.

The emergence of new centers of economic growth, which complement and often replace old industrial centers, provides researchers with new evidence of the paramount importance of new factors of economic growth: R&D potential, human capital, intersectoral clusters and their consequences, institutional conditions that stimulate long-term high-risk investment and high-tech startups as the basis of the knowledge economy [Mikhaylov, A., 2019. P. 29-42]. A striking example is Smart City Iskandar in Malaysia, whose state program provides for a 3-fold increase in GDP by 2025, a reduction in unemployment by more than 2 times - from 4% to 1.8% through the use of smart technologies economy, environment, infrastructure, public administration, social sphere. The concentration of innovative resources creates the necessary conditions for the development of high-tech industries.

Smart technologies allow to make profits from coastal and marine areas, as well as attract investment and human resources to these areas. On the other hand, they contribute to increasing the pressure on the environment [Makhnovsky, D., 2014.,P. 50-66].

Encouraging high-tech companies to locate their business near ports is an internationally recognized strategy for creating innovative port city systems such as Montreal (Canada) and Rotterdam (Netherlands) [Witte,P., Slack,B., Keesman,M., Jugie, J.-H., Wiegmans,B., 2018. P. 224 – 234].

Of particular interest are studies of regional features of economic activity of coastal regions of the EU, as current trends in economic development of coastal regions have certain similarities in the system of their development [Makhnovsky, D., 2014, P. 50-66]. Coastal regions have favorable conditions for the development of an innovative smart sector. Examples of successful forms of spatial networks are given by Mikhailov A. [Makhnovsky, D., 2014, P. 50-66]: “innovation clusters, science parks, research and technology innovation centers, as well as others, most of which, however, do not concern the maritime sector. These are Silicon Valley (USA), Mediterranean Valley (Denmark - Sweden), Bayan Lepas Free Industrial Zone (Malaysia), Zhongguancun Technology Center (China), Guro Digital Industrial Complex (South Korea) and Otaniemi Science Park (Finland)”.

The functioning of maritime clusters in Europe is primarily related to shipbuilding and shipping (Maritime cluster in Finland, Norway, Northern Germany). Examples of successful maritime clusters are the Dubai and Singapore clusters. The Dubai Maritime Cluster currently accounts for 7%, equivalent to AED 26.9 billion ($ 7.32 billion) in 2020 [Dubai signs maritime cluster]. International cooperation in the maritime sector of the Emirate's economy, while

ensuring the global competitiveness of the cluster, is recognized as a priority area of investment attraction. The Dubai Maritime Cluster Bureau is responsible for monitoring the effectiveness of achieving goals, current and new challenges, and creating tools to address business challenges. It also "deploys a number of programs and initiatives aimed at modernizing maritime and logistics services, in addition to updating legislation, regulation and infrastructure and improving operational processes to the highest standards of excellence, quality, innovation and safety at sea" [Dubai signs maritime cluster]. The maritime cluster also includes the Maritime Advisory Council, Dubai Marine Exploration, Dubai Maritime Club, Dubai Maritime Week, Dubai Maritime Summit, Dubai Maritime Program, Dubai Maritime Training Center and Maritime Creativity Laboratory. The UAE's policy is to take a leading position among maritime powers in terms of international traffic and maritime trade, and to innovate in the maritime sector. The result was cooperation with the Panamanian Maritime Cluster.

The administration and management of coastal regions in the EU confirms that at all three levels: national, regional and local - competitiveness has been identified as the main task of its activities. Thus, competitiveness is an important criterion for assessments of developed economies made by international institutions [Cambridge Econometrics, 2003].

The Flash Eurobarometer, which focused on citizens' awareness and perception of EU regional policy, shows that the vast majority of Europeans (81%) believe that EU-funded projects have a positive impact on their lives; among the surveyed 40% of respondents know about such projects in more detail.

Member States and regions have developed more than 120 Smart Specialization strategies through the use of partnership and multilevel governance, setting priorities for research and innovation investment. During 2014-2020, more than € 40 billion (and more than € 65 billion including national co-financing) was allocated to the regions through the European Regional Development Fund to finance these projects [European Comission, 11 p.].

The institutions of regional support in the EU are [European Comission, 11 p.]: Structural Reform Support Service, Smart Specialization Platform, European Cluster Policy Forum, European Regional Development Fund, European Institute of Innovation and Technology, European Commission and World Bank, European Fund for Strategic Investments, European Parliament and Council. EU special institutions dealing with the problems of coastal

regions operate in accordance with the principles and key strategies of international and regional organizations, stakeholders (Table 1).

Table 1. Institutes of coastal management in the EU

EU institutions dealing with the problems of coastal regions	International and regional organizations	Stakeholders
• European Parliament • European Economic and Social Committee • Committee of the Regions • European Maritime Safety Agency • European Environment Agency • European External Action Service • European Defense Agency: Maritime Surveillance • EU NAVFOR: EU military operation to combat piracy off the Somali coast	• UNESCO Intergovernmental Oceanographic Commission • Regional Fisheries Management Organizations (RROs) • Advisory Boards)	• Conference of Peripheral Marine Regions (CPMR) • European Science Foundation (ESF) • Maritime Council • Atlantic Arc Cities Conference • IMARES - Research Institute of Marine Ecology • Deltares Research Institute • ICES - International Council for the Study of the Sea

Source: based on (http://www.ec.europa.eu/maritimeaffairs/links_en).

The classic tool of regional governance is the Stairs to Perfection pilot project, which helps to bridge the innovation gap between EU regions by supporting the implementation of Smart Specialization strategies, developing and using complementarities between cohesion policy, Horizon 2020 and other EU funding programs.

The EU regional government has its own functions, in particular, its powers are legislative, executive and administrative. The regional government cannot issue laws, decrees but prepares regional bills for approval by the Regional Council. With regard to executive powers, the Regional Government has all executive powers over the laws and decisions of the Regional Council. The administrative powers of the Government of the EU region are to prepare regional budgets for the year in accordance with the prepared programs and development plans of the regions (which are prepared by it), balance sheet and financial statements.

Negotiations are currently underway with the European Parliament and Member States on the formation of the next EU budget for the period 2021-2027 and on the priorities of future regional policy, which will allow more efficient use of EU investment on the ground.

The ecosystem approach to increasing the competitiveness of coastal regions is based on the use of natural resources in order to reduce the threats posed by economic activity, preserve and increase land, water and living resources, flora and fauna in general (Table 2).

Table 2 Threats and means of preserving the ecosystems of coastal regions

Threats to the region's ecosystem	Means of ecosystem conservation
• intensive use of insecticides and herbicides; • construction of country plots on lands unsuitable for agriculture; • excessive grazing; • annual burning of dry vegetation in steppe beams, forest belts, river floodplains; • development of hydropower; • water reduction and siltation of rivers; • increase of recreational load on the territory of special nature protection significance; • poaching, disturbing animals in the quiet season; • littering of territories; • felling of field protection strips; • development of new mineral deposits; • overgrazing of cattle in areas with natural vegetation, etc.; • air emissions; • surface and groundwater pollution; • soil and air erosion; • flooding of territories; • distribution of agrolandscapes; • uneven development of the territory, etc.	• support of natural processes of formation of structure and structure of groups, their preservation and reproduction; preservation, reproduction; • inexhaustible use of natural ecosystems; • prevention of anthropogenic degradation of natural ecosystems; • preservation and restoration of natural and cultural complexes; • control and monitoring of the use of territories and water areas within the allowable ecological load; • introduction of environmental impact assessment systems; • components of conservation or restoration of the number and habitats of natural populations of species of plants, fungi and animals, including those listed in the Red Book of Ukraine and international lists of rare and endangered species; • maintenance of the natural state of populations; • prevention of the spread of diseases, pests and parasites among species of natural flora and fauna; • streamlining of economic and recreational activities within the territories and objects of the nature reserve fund; • formation and monitoring of the ecological network; • installation of water protection zones and coastal protection strips of water bodies;

Source: based on (http://www.ec.europa.eu/maritimeaffairs/links_en).

It should be noted that the peculiarity of the competitiveness of coastal regions is to take into account the specifics of indicators of socio-economic development of coastal regions, which are in the following areas:

- ecosystem approach to the protection, preservation and reproduction of the productive forces of the region;
- systematic approach to the development of the maritime complex of industries, recreation and tourism, overcoming seasonality;

- management of human resources in the region (creation of conditions for education, development and improvement of skills, capacity building) in order to purposefully ensure the favorable development of socio-economic processes in the region;
- ensuring the solution of problems of development of coastal regions at the level of region, communities, branches, enterprises.

Summary, recommendations

The development of programs for the competitiveness of coastal areas can directly contribute to increasing the level of innovative development of the region, supporting the effective management of ecosystems and improving the coordinated management of social institutions. However, the main thing for this program is to build on the principles of community trust in order to create a locally appropriate format for the prosperity of the region.

Important elements of maintaining the competitiveness of coastal regions through development programs are:

- comprehensive assessment of regional development needs;
- strong partnerships between regional government entities for the implementation of programs;
- clear goals and expected long-term results;
- strong and stable political will at the local, national and regional levels [Nelson, A., Johnson, G., Wenzel, L., Antoine, A., Ma, L., Manubag, L., 2019.].

R Hilborn [Hilborn, R., 2016, P. 224-226] notes that an example of effective coastal management is demonstrated by the United States, where there operate independent regional coastal management agencies, such as the California Coastal Commission.

Considering the world's experience of management of the maritime sector, it is necessary to note the effectiveness of the use of incentives. Among them there can be found economic (fisheries and aquaculture, biotechnology and marine shelf research), recreation, energy and shipbuilding, logistics, education, ecosystem and environmental protection activities. Table 3 lists activities systemized according to their type, as well as management decisions on their activation.

Table 3. Classification of world experience of managerial influences on the competitiveness of coastal regions

Types of activities	**Countries (groups of countries)**	**Incentive tools (management decisions to intensify activities)**
Economic, including fishing and aquaculture	• Adriatic, • Mediterranean and Black Sea basin countries, • Norway, • USA	• Introduction of ecological fish processing; • struggle with illegal fishing; • control and monitoring; • setting norms and restrictions.
Biotechnology and shelfseas research	• Countries of the Black and Baltic Seas, • UAE, • Panama, • USA.	• Scientific cooperation of working and expert groups; • development of joint regional cross –border programs; • providing communication sector of the rural economy, trade, transport.
Tourist and recreational	• Countries of the Baltic, • Black, • Adriatic and Mediterranean seas.	• Expanding demand for cruise tourism; • support for startups in tourism; • creation of development strategy; • training of specialists with skills in the tourism industry; • overcoming the off-season (on account of recovery of men of advanced age, holding conferences).
Industrial, includingenergy	• Baltic, • Black, • Adriatic and Mediterranean Seas, • Norway, • Denmark.	• Reducing regulatory barriers to cross-border investment; • functioning of marine clusters; • ensuring the safety of activities; • production of energy from renewable sources.
Logistics (sea transport)	• Basin countries of the Baltic, • Black, • Adriatic Seas, • UAE , • Canada.	• Ensuring the safety of activities; • clustering of port activities; • creating information systems for vessel traffic guarantee in spare security; • development of port terminals; increase of port capacity; development of highways due to transformation with road and rail connections.
Intellectual (science, education, innovation)	• Baltic Sea Basin Countries, • Norway, • UAE, • Panama, • Singapore, • Canada.	• Establishment of a network of maritime academies; • state participation in stimulating the creation of innovation clusters; • special programs of study and projects qualifications and skills increasingof the personnel involved in the maritime industry.
Ecosystem-environmental	• Black, • Adriatic and Mediterranean Seas, • New Zealand, • Philippines, • Australia, • USA.	• Development of environmental standards; • environmental control andmonitoring; • exchange of countries world experience management; • implementation of maritime spatial planning; integrated coastal zone management; investing in water supply and treatment facilities; • solving the problems of sea and ocean garbage; • development of joint transboundary seas and ocean ecosystem management plans.

Source: own study.

Thus, summarizing the world experience of managing coastal regions, it is worth noting the global trends in this process.

1. It should be noted that the existence of a clear EU blue growth strategy, marine development strategies (subordinate to the EU regional development strategy) allow local and regional authorities to use existing tools to create highly skilled jobs and economic opportunities in the maritime sector (taking into account the specifics of each region). Noteworthy are the strategies of smart specialization and high-tech sectors that require some education, skills and experience of specialists (biotechnology, research of the sea shelf with the help of robotics, etc.).

2. The functioning of maritime clusters is an example of an effective way to integrate maritime and related industries, promote international trade, increase the added value of the region, increase employment in the region, improve staff skills, develop and improve technology.

3. The growth of value added in the maritime sector depends on the level of development of regional infrastructure and related sectors. A prime example of the region's regional ecosystem is the Oslo Maritime Region, which, through the use of three principles - infrastructure, digitalisation and science - has become one of the EU's leading regions in terms of added value in the economy.

4. Given the state of the marine ecosystem, measures to protect and safeguard marine protected areas are necessary and relevant throughout the world and contribute to the restoration of the potential of the seas and oceans.

5. The tourism industry is becoming one of the drivers for increasing the competitiveness of the coastal region through the use of natural, geographical, economic and social regional opportunities. Overcoming the off-season and promoting ecotourism is one of the key tasks of coastal development strategies

6. Functioning of special regional bodies, signing of regional conventions on development of coastal territories, creation of unions - a characteristic feature of strategies of development of coastal regions.

7. In order to improve administrative and institutional capacity, maritime services and better management, data exchange, joint planning and coordinated management of existing resources (e.g., maritime spatial planning and integrated coastal zone management) have been introduced.

Table 4. Experience of ensuring the competitiveness of coastal regions

Elements of competitiveness	**World practices**
Territory	• Proclamation at the world level of the need to preserve and protect maritime areas; • conservation measures for coastal areas and unique marine protected areas using biological monitoring of environmental components; • encouraging maritime enterprises and industry associations to preserve the ecosystem component of coastal regions.
People	• Creation of territorial coastal clusters in order to provide skills and experience to staff, structured personnel and training infrastructure; • use of innovative tools and processes to attract, train and develop staff talent and increase employment in the maritime sector; • financing the establishment of educational institutions in the region.
Business processes	• Encouraging maritime enterprises and industry associations to create high-tech jobs; • stimulating startups and long-term investments based on smart technologies; increasing the efficiency of innovation clusters; • modernization of logistics services, infrastructure, improvement of operational processes in accordance with the highest standards of excellence, quality, innovation.
Administration	• Institutes of coastal regions management are represented at all levels of government - international, national and regional; • updating legislation with current requirements for safety at sea.

Source: own elaboration

Thus, based on the above, it is wrong to understand the coastal regions as peripheries, as the coastal zone is a favorable geographical location for trade, use of marine resources (shipping, fishing, green energy, etc.). World and European coastal regions are ahead of inland regions (with closed borders, landlocked) in terms of the transition from low value-added activities to the introduction of industries of the fourth industrial type, greater involvement of independent innovation potential.

The development of infrastructure, new high-speed communications and transport, and smart and digital infrastructure gave the inland regions an additional advantage in competing with the coast. The competitiveness of coastal regions in the context of globalization requires effective methods of organization, for example, maritime corporations, coastal clusters, which would take into account the geographical, climatic and socio-economic conditions of the regions.

The analysis of foreign experience has established that the strategy of ensuring the competitiveness of coastal regions has been identified as key at all levels of government in the European Union, the relevant bodies have been established and management tools

have been used. The experience of organizing a cluster system in the UAE, Singapore and Norway is a modern example of the efficient use of resources of all elements of competitiveness (territory, people, processes, administration).

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Convergence of energy efficiency policy in Ukraine and developed countries: the causal relationship between key determinants[2]

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Abstract: The unbalanced and unsynchronised ecological, energy, and economic policies of Ukraine provoke the dilemma on the priority of the new trajectory of the country's development and achievement of Sustainable Development Goals in energy-saving and increasing energy efficiency. Thus, the exacerbation of environmental conflicts, a huge energy consumption level, and increasing greenhouse gas emissions requires developing effective mechanisms to overcome and eliminate the mentioned issues. It should be realised with the simultaneous increase in the country's energy security. The paper aimed to check the convergence of the energy efficiency policy in Ukraine and developed countries. For the assessment of the energy policy efficiency, the study used the core indicators of The Energy Trilemma Index, which grouped by the three vectors: energy security; energy equity, environmental sustainability. The investigation object was Ukraine and EU developed countries (Lithuania, Latvia, Poland, Croatia). These countries have two mutual characteristics: in the years 1990-1992 the aforementioned countries started political transformations from refusing the monopoly of the Communist Party; in economic terms – the transition from centralised governance to the market economy. The time for analysis – the years 2000-2020; the dataset was obtained from the following databases: World Bank, Eurostat and Ukrstat. The study applied the σ-convergence and β-convergence for the analysis. The empirical results confirmed that reorientation of the Ukrainian energy sector based on implementing the instruments for declining the energy gaps could be the core drivers to synchronise the national energy policy with strategic targets under Sustainable Development Goals. Besides, it requires using cost-effective, innovative energy technologies and developing new options for the country's sustainable energy development. The study's findings could be applicable in resolving the contradictions in implementing the Ukrainian energy policy.

Keywords: energy policy, energy gap, energy efficiency, sustainable development.

JEL: P18; P28; P48; Q43; Q48

Introduction

In December 2019, the European Commission declared the updated European climate policy, "European Green Deal" [COP25 Summary Report 2019]. According to the document, the EU countries will reduce the emissions of polluters in the air to zero by 2050 [Financing 2020] with simultaneous increasing of the share of renewable energy in the energy balance. Ukraine has accepted the EU vector of future development. It aims to synchronise all Ukrainian policies, involving energy policy with the strategic orienteers in the EU on the transition to a circular and carbon-free economy. The snowballing growth of the demand on energy sources

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(consider the official report of World Energy Council [WORLD 2020]) suggesting that the global energy consumption in 2030 could increase by 55% compared to 2020, provokes changes in the structure of the country's energy balance. Thus, as other EU oriented countries, Ukraine should develop and implement a balanced policy on synchronising the national energy policy with the European one.

Theoretical premises

The scientific community has already accumulated a huge scientific background on evaluating the efficiency of national strategy energy development. Thus, in the paper [Zhang et al., 2011] analysed China's evolution and the USA's energy strategies based on Bai and Perron test. Jensen L. and Sperling K. [Jensen & Sperling, 2019] improved the "Danish approach" by considering the strategic energy planning. Siksnelyte et al. [Siksnelyte et al. 2019] estimated the efficiency of the implemented actions on energy sustainability using the Multi-Objective Optimisation MULTIMOORA.

Huge scientific results have already existed on identification the economic [Akimova et al., 2017; Ibragimov, 2019a], social [Kwilinski et al., 2020a; Vasylieva et al., 2019; Kharazishvili et al., 2020; Borychowski et al., 2020], political [Ziabina & Pimonenko, 2020; Dalevska et al., 2019; Dementyev&Kwilinski, 2020], financial [Pimonenko et al., 2017b; Sotnyk et al., 2018; Vasylieva et al., 2018; Rubanov et al., 2019; Bilan et al., 2019a; Pająk, et al., 2016; Kaźmierczyk & Chinalska, 2018], investment [Lipkova & Braga, 2016; Kendiukhov & Tvaronavičienė, 2017; Ibragimov, 2019b; Kasztelnik & Gaines, 2019; Lyeonov et al., 2019], technological [Pimonenko et al., 2017a, Kwilinski 2018; Miskiewicz 2020; Kwilinski et al., 2020b; Akimov et al., 2020; Bogachov et al., 2020; Chygryn et al., 2020; Czyżewski et al., 2019; 2020; Dzwigol&Dźwigoł-Barosz, 2018; 2020; Dzwigol, 2019; 2020; Dzwigol et al., 2020; Kuzior et al., 2020; Kwilinski et al., 2019; Lyulyov et al., 2020; Miskiewicz, 2020; Saługa et al., 2020; Savchenko et al., 2019; Tkachenko et al., 2019a; 2019b; 2019c], marketing [Akhundova et al. 2020], ecological [Chygryn & Krasniak 2015; Cebula et al. 2018; Dkhili 2018; Pimonenko, 2019; Pavlyk 2020; Kyrylov et al., 2020] determinants in providing the energy efficiency of the national economy. The world scientific community has investigated the approaches to assessing and forecasting energy efficiency gaps, principals, and instruments to implement the government policy to minimise energy efficiency gaps. Thus, some authors [Gerarden et al., 2017; Stadelmann,

2017] allocated four core factors which provoked the energy efficiency gaps: market failures, multi-vector interests of stakeholders, valuation errors, minimisation of energy efficiency costs. Labanca P. [Labanca, 2018] defined energy systems as social and technical logical systems, where the energy technologies' improvement provoked social practices, values, relationships, and institutions. The scientists in the paper by Mardani et al. [2017] used the DEA method to assess the energy efficiency gaps under energy efficiency projects' implementation. VakulenkoI and MyroshnychenkoIu [Vakulenko & Myroshnychenko, 2015] highlighted the drivers of increasing energy efficiency in Ukraine under the investment limitation.

The scientists used empirical data to identify the cause of unbalanced energy development and justify increasing its energy efficiency. The methodological base for the estimation was the concept of σ- and β-convergence. The indicators of variation in the energy efficiency level for the countries' applied for the assessment of σ-convergence. At the same time, β-convergence based on the hypothesis that the countries' stationarity characteristics were similar, or the countries had the same trajectory of sustainable growth. Thus, the authors in the paper by Han et al. [2018] analysed the impact of trade integration and the regional cooperation on the energy convergence in 89 countries participating in the Belt and Road initiative. They found that σ- and β-convergence for 2000-2014 confirmed the statistically significant and positive impact of trade integration on the countries' energy-effective cointegration, particularly with low- and middle-income countries. A similar conclusion was made by Qi et al. [2019] for 59 countries included in Belt and Road initiative. The findings confirmed that the higher level of energy intensity's convergence was in countries with a high level of bilateral trade and imports of technological and innovative equipment from China than others. Using the stochastic convergence models for 27 OECD countries during the 1980–2014 years, Bulut U. and Durusu-Ciftci D. [Bulut&Durusu-Ciftci, 2018] proved the lack of convergence to the average level of energy intensities in the OECD of the following countries: Iceland, South Korea, USA, Mexico, Chile. It requires the providing of energy efficiency policy through providing of the implementation of innovations and compliance with the international environmental agreements. Apergis N. and Christou C. [Apergis&Christou, 2016], using the convergence club algorithm for 31 countries for 1972–2012, allowed concluding that the energy productivity convergence for all analysed countries has not existed.

Most investigations used the integrated energy efficiency indicators (energy use/consumption intensity, energy productivity, energy intensity, etc.) to assess σ- and β-convergence. Simultaneously, the snowballing negative consequences from ecological contradictions, increasing energy consumption in countries, and the growth of greenhouse gas emissions require the development of mechanisms for solving and eliminating the issues mentioned above to increase energy security. It should be noted that estimation of the convergence between ecological, social and economic development of the country allowed eliminating the dilemmas of indicating how to achieve the Sustainable Development Goals in energy efficiency and energy saving. In this direction, the World Energy Council developed the concept «Energy Trilemma», which allowed accepting the justified decisions to balance energy security; energy equity, and environmental sustainability [World Energy Council 2020; Pająk et al., 2017]. Therefore, the balance was estimated by the World Energy Trilemma Index. Considering the official report 2019, nine out of ten countries-leaders in the rating were European countries (Switzerland, Sweden, Denmark, the United Kingdom, Finland, France, Austria, Luxembourg, Germany, New Zealand). It was a result of the balanced EU energy policy: developing the single energy infrastructure in EU (Treaty on European Union, Maastricht), providing Directives EU №2012/27/EU "The energy efficiency" and №2014/94/EU "On the deployment of alternative fuels infrastructure", recommendations, EU Commission № 2012/148/EU "The preparations for the roll-out of smart metering systems", The Strategic Energy Technology (SET), climate strategy «Green Deal Policy», etc. The EU vector of the Ukrainian national economy's development required the synchronisation of government policy involving providing energy efficiency.

The paper aimed to estimate: the level of asynchrony of the state energy policy of Ukraine with European practices of energy efficiency strategy implementation based on the World Energy Trilemma Index and concept of σ-convergence; the responsiveness to national policy changes to European standards regulating energy development using the concept of β-convergence.

Methodology

In the methodological basis for the analysis the authors used σ- and β-convergence. Considering the papers of Han et al. [2018] and Qi et al. [2019] for the σ-convergence's assessment, the study used the standard deviation across countries *i* in time *t*:

(1) $$\sigma_t = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(lnTR_{jit} - \overline{lnTR_{jit}})^2}$$

деTR – Energy Trilemma subindexes j :energy security, energy equity, environmental sustainability;

N– number of countries;

i – country;

t – time.

Thus, considering the concept if the standard deviation declined, the σ-convergence observed between countries, in the other case – divergence.

The study used the regression equation for the assessment of β-convergence:

(2) $$ln(\frac{TR_{jit}}{TR_{jit-1}}) = \alpha + \theta \ln\left(TR_{jit-1}\right) + \phi X_{it} + \varepsilon$$

where X – matrix of additional endogenous variables which indicated the country's features and all owed saving the stationarity of the variables at the same level;

α, θ, ϕ – calculated variables;

ε – error term.

If θ was less than zero, the convergence existed for selected parameters. The parameters' absolute value characterises the relationship between the beginning level of energy efficiency and its growth rate. The β value indicated convergence speed, the percentage of distance that achieved long-term energy efficiency equilibrium by the country in one time.

The exogenous variables were globalisation index (KOF) and trade openness (Trade). Considering the authors' conclusions in the papers by Cole [2006], Bilan et al. [2019b] Kostiukevych et al. [2020], Panchenko et al. [2020], adn Lyulyov et al. [2021], the globalisation process indicated the trend of country's economic development, and trade liberalisation led to increasing energy usage per capita.

The object of the investigation was Ukraine, and for comparison, the study selected 4 EU countries (Lithuania, Latvia, Poland, Croatia) which had similar characteristics in: political transformation (1990-1992) from rejecting the monopoly of the Communist Party; economy – the transition from centralised management to a market economy. The core indicators of the countries selected for analysis are presented in Table 1.

Table 1. The explanation of variables

Variables	Abbreviations	Source
Energy Security	ES	World Energy Council
Energy Equity	EE	World Energy Council
Environmental Sustainability	ESus	World Energy Council
Globalisation Index	KOF	KOF Swiss EconomicInstitute
Trade (% of GDP)	Trade	World Data Bank

Source: own work

The descriptive statistics of the selected variables is presented in Table 2.

Table 2. The descriptive statistics of EE, ES, ESus, KOF, Trade for the selected countries, 2014-2020

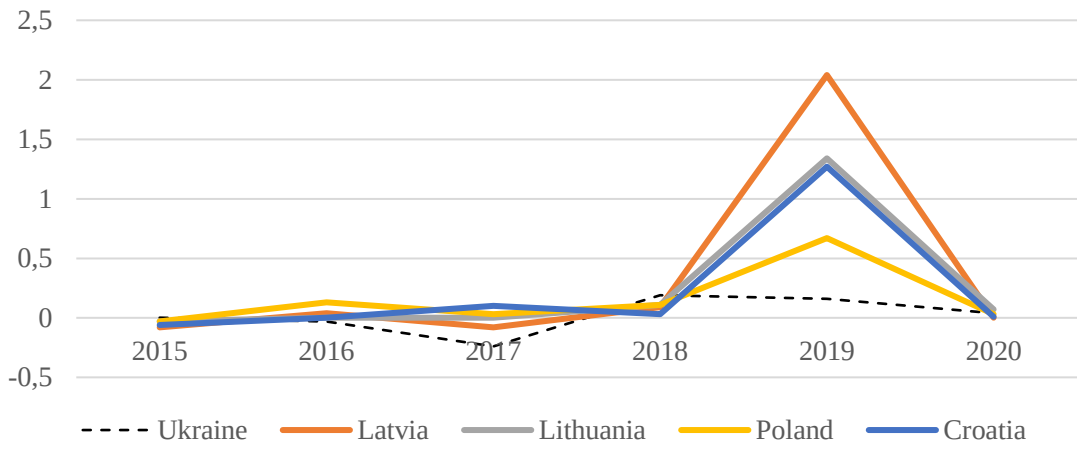
	Country	Mean	Median	Maximum	Minimum	Std.Dev.	Skewness	Kurtosis
EE	Ukraine	119.64	116.70	126.80	115.50	4.61	0.54	1.63
	Latvia	103.47	102.80	105.90	102.00	1.62	0.73	1.82
	Lithuania	103.86	100.90	113.10	99.50	6.31	0.92	1.89
	Poland	101.49	101.50	101.90	100.90	0.33	-0.59	2.54
	Croatia	96.70	96.50	98.00	95.90	0.69	0.96	2.91
ES	Ukraine	119.59	118.00	125.60	113.30	4.61	0.16	1.72
	Latvia	137.57	139.20	141.50	126.10	5.29	-1.70	4.41
	Lithuanian	110.54	114.60	117.10	89.80	10.02	-1.48	3.68
	Poland	112.99	113.50	114.80	109.00	1.97	-1.26	3.48
	Croatia	120.67	122.00	123.80	110.30	4.63	-1.93	4.93
ESus	Ukraine	119.79	122.00	127.60	110.70	6.55	-0.29	1.67
	Latvia	101.10	100.50	104.60	96.70	2.69	-0.24	2.18
	Lithuanian	98.79	99.20	103.10	93.30	3.35	-0.41	2.12
	Poland	117.83	118.20	120.00	114.30	2.05	-0.59	2.19
	Croatia	109.99	109.30	114.10	107.40	2.63	0.41	1.67
KOF	Ukraine	74.99	74.95	76.62	73.38	1.13	0.06	1.98
	Latvia	79.06	79.42	82.71	75.22	2.82	-0.26	1.81
	Lithuanian	80.84	80.89	82.94	78.83	1.43	0.11	1.93
	Poland	81.00	80.40	83.57	79.67	1.57	0.87	2.00
	Croatia	81.18	80.08	84.32	79.52	1.96	0.78	1.89
Tra	Ukraine	100.34	100.69	107.08	95.15	4.66	0.21	1.57
	Latvia	126.43	122.93	135.88	119.19	6.55	0.37	1.49

	Lithuanian	164.57	160.60	181.90	147.61	12.90	0.06	1.59
	Poland	101.86	102.79	109.20	93.73	5.58	-0.23	1.83
	Croatia	93.79	93.48	100.36	88.70	3.55	0.59	3.12

Source: own work

The findings in Table 2 allowed concluding that Ukraine, among selected countries, had a better position on the average value of the subindexes Energy Equity (119.64) and Environmental Sustainability (119.79). At the same time, the Skewness of the subindex Environmental Sustainability was negative (-0,29). It means that the average value could not paint the real picture of the country's development. All indicators had a positive Kurtosis for Ukraine, which confirmed that the analysed variables were possibly leptokurtic in form. Latvia had the highest average value of the subindex Energy Security (137.57). The standard deviation of variables for all countries was less than 10%, which meant a weak variability of objects' features. It should be noted that among analysed countries, Ukraine had been the leader on Energy Trilemma Index (66.00) before 2019. However, the EU countries had been demonstrating an increase of the Energy Trilemma Index since 2019 (Fig. 1)

Figure 1. The growth rate of Energy Trilemma Index for analysed countries, 2014-2020.



Sources: compiled by the authors.

Results

Considering the abovementioned methodology, at the first stage, the study estimated the σ-convergence. The findings of the σ-convergence assessment are presented in Table 3.

Table 3. The empirical justification of σ-convergence between variables for selected countries

σ-convergence	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
	For subindex energy security						
without Ukraine	0.21	0.02	0.04	0.05	0.05	0.05	0.04
with Ukraine	0.22	0.03	0.05	0.07	0.07	0.02	0.03
	for subindex energy equity						
without Ukraine	0.01	0.01	0.02	0.02	0.02	0.05	0.04
with Ukraine	0.01	0.01	0.01	0.03	0.02	0.03	0.02
	for subindex environmental sustainability						
without Ukraine	0.03	0.01	0.04	0.01	0.01	0.03	0.04
with Ukraine	0.06	0.04	0.03	0.01	0.02	0.05	0.01

Sources: own work

The declining of the standard deviation of natural logarithms of subindexes Energy Security and Environmental Sustainability confirmed that the countries' government-oriented cooperation mechanism focused on the achievement of the process convergence in energy security and environmental sustainability. Simultaneously, during the years 2014-2020, for the selected countries, the standard deviation of the natural logarithms of the subindex Energy Equity increased. It justified the strengthening of cooperation on increasing the energy efficiency of the countries.

The confirmation of the σ-convergence allowed checking hypothesis on β-convergence between processes for the selected countries. At the next stage, the stationarity of the selected variables was indicated for β-convergence assessment. The findings of the panel unit root test are presented in Table 4.

Table 4. The findings of stationarity analysis using the panel unit root test

Statistics (p-value)		Levin, Lin & Chu	Hadri	ADF-Fisher Chi-square	PP-Fisher Chi-square
$\ln(EE_{t-1})$	at level	-56.37 (0.00)	3.14 (0.00)	6.58 (0.76)	9.22 (0.51)
	at 1st difference	-23.61 (0.00)	1.69 (0.04)	31.86 (0.00)	23.45 (0.01)
$\ln(\frac{EE_t}{EE_{t-1}})$	at level	-23.98 (0.00)	1.69 (0.04)	31.94 (0.00)	23.36 (0.01)
	at 1st difference	-21.78 (0.00)	4.37 (0.00)	35.79 (0.00)	39.68 (0.00)
$\ln(ES_{t-1})$	at level	-4.11 (0.00)	2.89 (0.00)	14.52 (0.15)	1.67 (0.99)
	at 1st difference	-10.09 (0.00)	3.77 (0.00)	47.49 (0.00)	65.98 (0.00)
$\ln(\frac{ES_t}{ES_{t-1}})$	at level	-10.13 (0.00)	3.76 (0.00)	47.50 (0.00)	66.02 (0.00)
	at 1st difference	-8.36 (0.00)	2.61 (0.00)	49.65 (0.00)	68.34 (0.00)
$\ln(ESus_{t-1})$	at level	0.01 (0.51)	3.46 (0.00)	14.04 (0.17)	6.71 (0.75)
	at 1st difference	-4.00 (0.00)	3.03 (0.00)	26.13 (0.00)	31.38 (0.00)
$\ln(\frac{ESus_t}{ESus_{t-1}})$	at level	-4.00 (0.00)	3.03 (0.00)	26.14 (0.00)	31.42 (0.00)
	at 1st difference	-2.14 (0.00)	4.84 (0.00)	28.76 (0.00)	38.20 (0.00)
lnKOF	at level	4.68 (1.00)	4.00 (0.00)	3.21 (0.97)	0.09 (1.00)
	at 1st difference	-1.52 (0.06)	4.04 (0.00)	17.06 (0.07)	17.02 (0.06)
lnTrade	at level	0.20 (0.58)	2.98 (0.00)	7.87 (0.64)	2.65 (0.98)
	at 1st difference	-2.85 (0.00)	2.03 (0.02)	16.35 (0.03)	27.09 (0.00)

Source: own work

An analysis of the stationarity of time series at the level confirmed that for ln (EE_{t-1}) (tests ADF-Fisher Chi-square, PP-Fisher Chi-square), ln(ES_{t-1}) (teats ADF-Fisher Chi-square, PP-Fisher Chi-square), ln($ESus_{t-1}$) (tests Levin, Lin & Chu, ADF-Fisher Chi-square, PP-Fisher Chi-square), lnKOF (tests Levin, Lin & Chu, ADF-Fisher Chi-square, PP-Fisher Chi-square), lnTrade (тести Levin, Lin & Chu, ADF-Fisher Chi-square, PP-Fisher Chi-square) the absolute values of τ-statistic are less than the absolute values of minimal value at 1 %, 5 % and 10 % significance. It did not allow rejecting the null hypothesis on exitance unit root in the time series at the level. The minimal probability that time series had the unit root test and non-stationary was 49% (p-value>10 %). At the same time, the findings of Levin, Lin & Chu, Hadri, ADF-Fisher Chi-square, PP-Fisher Chi-square tests for all variables at the first level confirmed the stationarity of the modified variables. Therefore, the time series at the first level was stationary.

The findings of β-convergence's assessment are presented in Table 5.

Table 5. The finding of the β-convergenceanalysis

	$\ln(\frac{EE_t}{EE_{t-1}})$	$\ln(\frac{ES_t}{ES_{t-1}})$	$\ln(\frac{ESus_t}{ESus_{t-1}})$
$\ln(EE_{t-1})$	-0.093 (0.068)	–	–
$\ln(ES_{t-1})$	–	-0.007 (0.033)	–
$\ln(ESus_{t-1})$	–	–	-0.147 (0.02)
lnKOF	0.031 (0.08)	-0.04 (0.709)	-0.209 (0.02)
lnTrade	0.029 (0.067)	0.049 (0.234)	0.048 (0.13)

Source: own work

Considering the findings in Table 5, the absolute values of β-convergence changes in the interval from 0.093 (energy security) to 0.147 (environmental sustainability). It confirmed the high convergence between countries on these parameters. The positive, statistically significant impact of globalisation index and trade openness confirmed the possible acceleration of β-convergence for Energy Security. It meant that the growth rate of Energy Security was high at the first stage and then slowed down with the value's increase, and then approached stability. Simultaneously, KOF's and Trade's impact on energy efficiency was not statistically significant, which confirmed that KOF and Trade did not affect the countries' convergence on energy equity. Despite the high absolute coefficient of β-convergence, globalisation processes constrained its acceleration.

Summary, recommendations

The issues regarding the effective use of energy recourses and responsible attitude to the environment had the priority for Ukrainian government, which complied with the Directive 2012/27/EU of the European Parliament and the Council "On energy efficiency" and 2014/94/EU "On the deployment of alternative fuels infrastructure", 2012/148/EU Commission Recommendation "On preparations for the roll-out of smart metering systems", The Strategic Energy Technology (SET), Ukrainian Energy Strategy to 2030 (from 24 July 2013), National strategy on heat supply to 2030. In this case, the transformation of the Ukrainian energy sector should be realised by implementing effective mechanisms to achieve energy efficiency policy's convergence with leading EU countries. Thus, the implementation of modern innovative energy technologies could be a core instrument for overcoming climate

change's negative consequences. Besides, it allowed creating new options for the sustainable energy development of the country.

The findings of σ- and β-convergence assessment confirmed the convergence of national to EU energy policies. Simultaneously, the increasing Ukrainian energy efficiency was limited by the huge share of fuel import, involving natural gas and oil, and the high intensity of CO2 emissions.

The huge level of energy infrastructure depreciation restricted the increasing energy efficiency and required additional investment for renovation and modernisation. Besides, the findings of σ-convergence on subindexes Energy Trilemma Index confirmed the necessity to improve the energy sector's legislation, particularly on using renewable energy in the country, example.g, the development of the biogas technologies.

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Sustainable development of the border city in the context of European integration processes and decentralization in Ukraine (on the example of Lutsk, 2008-2020)

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Abstract: Regional development of the territories of Ukraine neighboring the countries of the European Union is the focus of research by different institutions of the EU. The authors analyzed the sustainable development of the border city in the social and economic spheres, taking into account local, national and European integration contexts. Sociological research data, statistics and some open data were used to analyze socio-economic indicators in the dynamics. However, their analysis is complicated by decentralization – a new territorial structure of Ukrainian regions approved in 2020, and it is impossible to predict the development of the city within the new boundaries due to the lack of statistics collected in accordance with the new administrative division of territories. Sociological research has shown a social climate in the city in which the residents associate the lack of social benefits[3] with problems at the state level, not local, need new knowledge, skills, experience etc., and for this purpose they are focused on migration. The dynamics of population aging in the city and the region is not critical, but local authorities are forced to address the issue of returning people aged 65+ to the labor market, or support economy sectors in which they can realize their experience and potential. Professional failure of people aged 41+ requires quality education and an innovative economy. The Volyn Region and the city of Lutsk are characterized by consistently high quality of school education; it is a good basis for economic development. The paradox of the city's economic development is that with a good pace of enterprise development and revenues to budget, population incomes are low. Issues of human resource quality and quality of life are the priority issues of decentralized territories of Volyn.

Key words: budget, quality of education, agingpopulation, social well-being, decentralization.

JEL: H720, H750, J110, J170, R110

Introduction

The European Union is the initiator of a number of programs for sustainable development of territories, which extend not only to EU countries. Ukraine is a participant in many such programs. In particular, «New European Union's policy seeks to cultivate complete urban policies» because «urban regions are the driving forces of Europe's economic

[3] The Scale of Social well-being (methodic by Ye. Golovakha and N. Panina) contains 44 social benefits from 11 spheres of life (the scale of sufficiency of benefits: 1 – not-sufficient, 2 – difficult to say, 3 – sufficient, 4 – not interested) (See: [Salnikova; 2014, 2017]).

development, they are centres of creativity and innovation, and also, they are the factor of the achievement of “Europe 2020” strategy» [European Commission, 2018].

The significance of cities is also evidenced by the Intercultural cities program from the Council of Europe, whose participants amount to more than 140 cities in the world since 2008. Lutsk is also a participant in this program. Within it, is possible to compare not only the state of the urban environment of the participating cities, but also the features of their development [Kuznetsova, 2016; Council of Europe], obtain interesting experiences, coordinate development goals, etc. The Lutsk case study is one of many studies of urban centers that have recently been more and more intensively conducted at an international level (e.g., [Delitheou, Georgakopoulou, 2019; Deng et al., 2018]).

Rapid urbanization strengthens the role of the city; in particular, the city becomes the key actor in a globalized world [Nordström, Schlingmann; 2014]. However, the reform of decentralization in Ukraine has not simply reformatted the territorial structure; it has changed the significance of separate territories, or created new centres of concentration of economic production and human capital. Prior to the reform, these centres had different chances for their sustainable development; regional centres have accumulated more capital than the rest administrative units. But many questions are open. For example, is the development of the city as the centre of the region sufficient to further concentrate its resources? What are the main directions of outflow of resources: national or global? What are the trends and paradoxes of territorial development? The research problem is the need for a comprehensive study of various spheres of life in the region, taking into account internal and external integration processes for its sustainable development.

The case of the city of Lutsk as the centre of the Volyn Region, which borders the EU and has fairly active cross-border cooperation at minimum with Poland, is interesting in such a research framework.

Methodology

Scientists view sustainable development as one that meets human needs and improves the quality of life, so that ecosystems can preserve themselves through renewal [Berkes et al., 2000]. However, the combination of social and ecological systems is closely linked to the economic system, as sustainability is a process that affects all three dimensions. This view

is shared by other scientists: sustainable development is an embedded hierarchy consisting of nature, society and the economy as a living environment, which allows human society to build an economic system that does not pose a threat to the environment [McLaren, Agyeman; 2015]. However, D. McLaren and J. Agyeman believe that «the future of humanity is urban, and the nature of urban space enables, and necessitates, sharing – of resources, goods and services, experiences». McLaren and Agyeman propose a new “sharing paradigm” [McLaren, Agyeman; 2015].

The social system, economic situation and ecological situation are also key in the concept of sustainable development management of the city of Ukrainian economists N. Pavlikha and M. Voichuk [Pavlikha, Voichuk; 2019; p. 17]; in their opinion, sustainable development of the city can be considered at the following levels: local, regional, national, global [Pavlikha, Voichuk; 2019; p. 12]. All these levels of sustainable development analysis are important in the context of European integration processes and taking into account the new territorial structure of Ukraine. Decentralization raises the same questions. Whether the city will continue to have a regional impact or it will exist exclusively separately; the border location makes the city attractive to European integration, or the public policy remains dominant.

The urban researches have two areas: (1) the study of various urban systems (transport infrastructure, healthcare, education, ecology, urban economics, human capital, etc.) with (2) the involvement of citizens in the urban planning process.

In accordance with these concepts, the authors limit this study to the observing of two spheres of life of the city – social and economic, as indicators in these areas intersect. The social sphere is represented by such indicators as the social well-being of the city's residents, their migration intentions, and income levels, with a special emphasis on the analysis of human capital, namely: human resources and quality education. The latter indicators also describe the economic sphere, for the analysis of which the indicators of revenues to budget and retail turnover were used.

The purpose of the article is to analyze the socio-economic dynamics of indicators, taking into account local, national, and European integration contexts. The empirical basis of the article is the data of sociological research and statistical data, including those provided by the Lutsk City Council specifically for this study. All sociological research was conducted by the Sociological Research Laboratory of Lesya Ukrainka Eastern European National

University[4] (project manager – S. Salnikova). Analysis of primary data was made in the SPSS program; descriptive statistics, methods of univariate and bivariate analysis, as well as correlation analysis were used. The authors used regression analysis to forecast some indicators.

It is worth noting that the new territorial division of Ukraine was adopted in 2020 and the State Statistics Service of Ukraine has not yet collected data in accordance with it.

Results and discussion

Social climate

The social climate is no less important than those of the political or economic nature; sociological research is the best way to study it [Salnikova, 2014; Szabó, 2019].

We will not analyse the results of the research, we will only use some important conclusions. In particular, the results of the "Social well-being of Lutsk Residents" monitoring (2008–2018) show that poor social well-being of the residents of Lutsk is associated with problems at the state level [Salnikova, 2014], not local; and to improve it, residents need specific individual qualities and knowledge [Salnikova, 2017, p. 105]. The political frustration that usually occurs a year after every election makes it difficult to link regional stability to the national level. The development of the region has either a local character, or such a character where there are practices that provide residents with the necessary skills, abilities, qualities and experience.

The sociological survey "Main Directions and Prospects of Development of the Lutsk City" (2016) exposed the demographic problem associated with the outflow of youth and the need for special social inclusion of people of mature age [Salnikova, 2018].

Among the top problems in 2016 were the following: the outflow of young people to large cities and abroad (30.8%), the lack of gerontological institutions for serving the elderly people [Salnikova, 2018, p. 49–50]. The main reason for the former is the impossibility of professional realization in the city, residents of the city of working age 41+ with a higher education and good financial condition speak about this; they are characterized by a high level of mobility. Higher education encourages relocation in the event of a polar financial condition

[4] In 2020, the university returned to its previous title – Lesya Ukrainka Volyn National University.

of the family. Thus, the lack of opportunities for professionals will contribute to the fact that they will consider Lutsk as a place to obtain a good education, as a transit settlement [Salnikova, 2018, pp. 47, 51]. Contrary to the expectations of researchers, the main reason for leaving the city was not educational mobility, but professional one. Professionalism should be associated with a high economic status, but, unfortunately, low salaries and an appropriate standard of living are characteristic of Lutsk. Representatives of professional employment are not employed, as a rule, in the shadow sector, therefore, the average official salary can not be considered high (317$ – 2013, 220$ – 2014, 151$ – 2015, 158$ – 2016, 220$ – 2017, 269$ – 2018, 335$ – 2019). It is important to note that the average salary in the region does not statistically differ from the same indicator in the city from 2015 [Annual "Volyn 2019", 2020, p. 87].

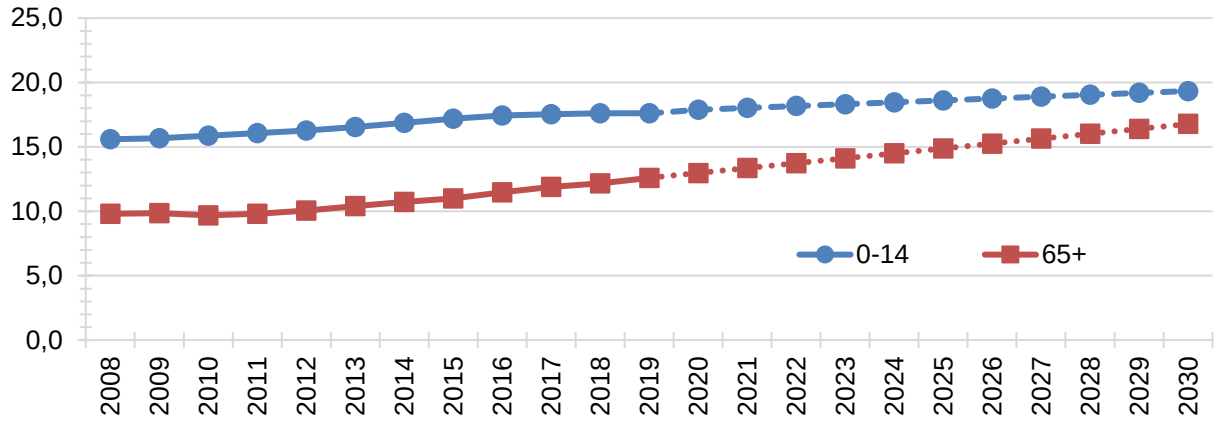
About human resources

The problem of low chances of professional realization is partially related to the problem of an increase in number of elderly people: the decrease in the category of people of working age automatically increases the category of people at the retirement age. But this situation is much more complicated.

First, the problem of the aging population in Lutsk and the Volyn Region does not have such 'catastrophic' dynamics as for European countries[5]: the share of the population in the age cohort of 0-14 years (those who will enter the labor market tomorrow) exceeds the share of the population aged 65+ (those who will leave the labor market tomorrow). The results of the regression analysis demonstrate the persistence of this trend until 2030 for both the city and the region (Fig. 1, Fig. 2).

[5] «Europe is ageing overall and it is threatened by a real reduction of the original population and the national and cultural definition thereof. This fact is irrefutable; it is practically pointless to prove it statistically» [Arltová et al., 2016, p. 198]. But the statistics from Eurostat (https://ec.europa.eu/eurostat/) is very useful [Ageing Europe, 2020], especially The EU Open Data Portal (https://data.europa.eu/euodp/en) with access to datasets from the EU.

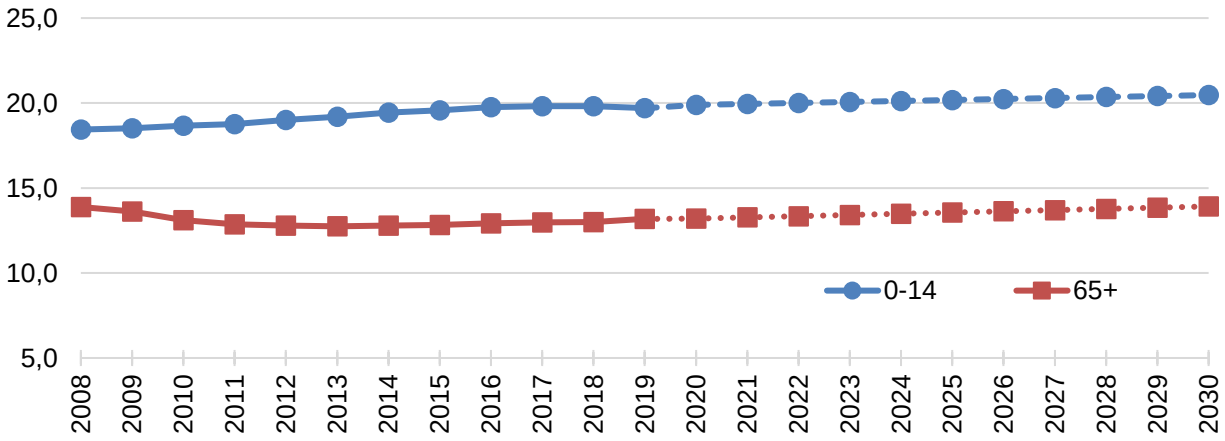
Figure 1. Population ages '0-14' or '65+' with forecasting, Lutsk (% of total)



Source: own elaboration, based on data from Lutsk City Council [Annual "Volyn 2019", 2020, p. 40].

Secondly, Volyn is not an industrial region; according to Czech economists, industrial regions will suffer the greatest losses due to an aging population [Arltová et al., 2016]. The main cities of the region (Lutsk, Kovel) and northern districts (Kamin-Kashirskyi, Ratnivskyi, Manevytskyi) have a slight natural increase in population (from 100.1% to 100.5%) [Main Department…, 2019].

Figure 2. Population ages '0-14' or '65+' with forecasting, Volyn Region (% of total)



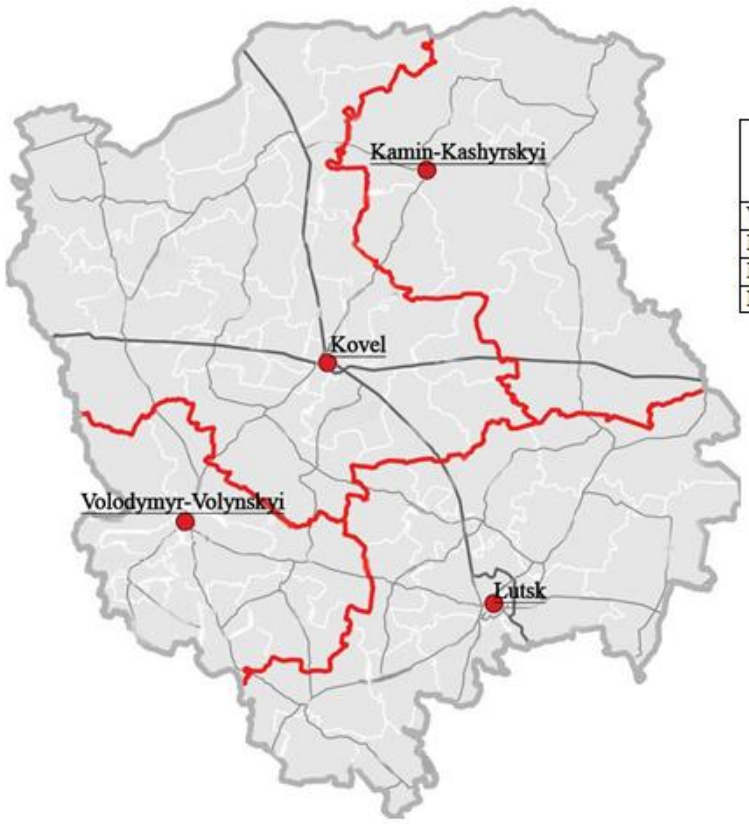
Source: own elabtoration, data from [Annual "Volyn 2019", 2020, p.43].

On the other hand, in order to minimize the problem of population decline, Volyn's authorities will have to decide on the issue of either returning people aged 65+ to the labor market, or supporting sectors of the regional economy, where they can realize their experience and potential. However, the priority is to decide the issue of professional realization of the most active and professional population aged 41+, and without an innovative

economy, it is difficult to do. The city and regional authorities and all those who manage human resources should already solve the problem of human capital as the most valuable resource for the successful development of a city / region / country, and not just maintaining the infrastructure of the territory.

Negative demographic trends are typical for all investigated levels – European Union, Ukraine, Volyn, and Lutsk – with varying degrees of intensity. But the dominance of labor migrations flows over permanent ones are characteristic of Lutsk and Volyn only; and Lutsk as a center of urbanization of Volyn has a low migration inflow. The Volyn Region has always been a major donor of human resources for Lutsk. Today, only three northern districts of the region, as mentioned, show a general population growth, but due to decentralization, they belong to other territorial units (Fig. 3). The presence of a fourth district with its center in Kamin-Kashirsk (Fig. 3) is a guarantee that Lutsk will be the urban center of Volyn in the future; otherwise, the city of Kovel would be a serious competition to Lutsk in the struggle for human capital. Other cities in the region do not have such opportunities.

Figure 3. The final version of the new territorial structure of the Volyn Region, adopted by the Verkhovna Rada on July 17, 2020



District	Population (thousand people)
Volodymyr-Volynskyi	174.7
Kamin-Kashyrskyi	132.4
Kovelskyi	271
Lutskyi	457.3

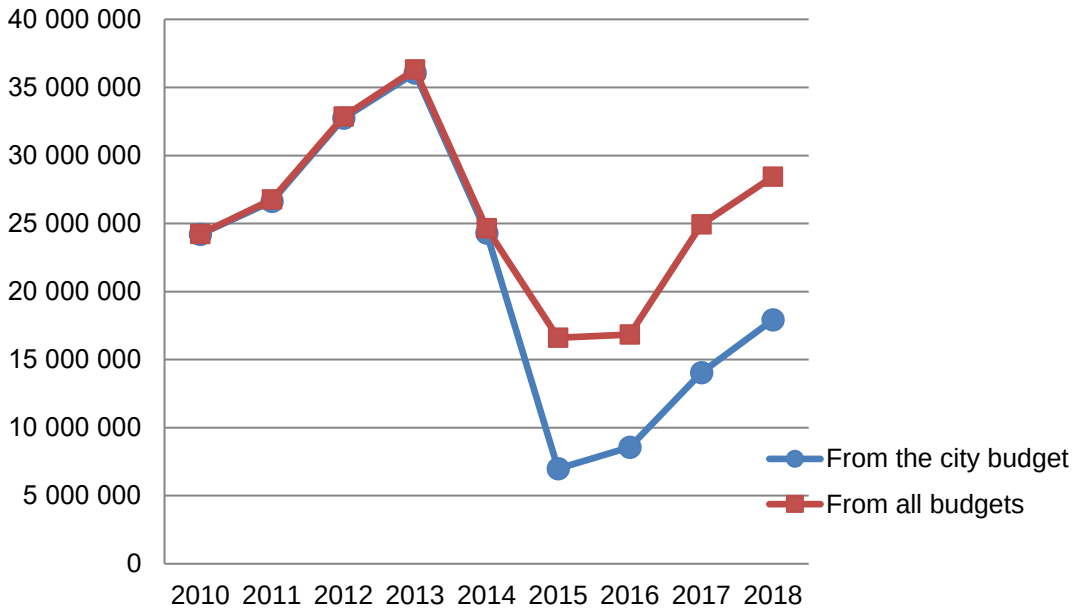
Source: own translation from Decentralization, https://decentralization.gov.ua/new-rayons/volynska.

Lutsk can hope for migratory population growth only if it 'guarantees' quality education and living standards for migrants. The decentralization has made local communities more financially independent, so the quality of life in the city can only be linked to an urban lifestyle or higher chances of professional realization.

Sphere of education

The education sphere is not particularly 'interesting': a decrease in funding (Fig. 4), a decrease in the number of children enrolled in preschool educational schools (from 909 children in 2008 to 1,593 children in 2012, and 600 children in 2018), while the number of children in groups increases (from 23 in 2008 to 27 in 2018), only one residential quarter was built with the appropriate social infrastructure (kindergarten, school), three private schools and several kindergartens were opened until 2020[6]. State institutions dominate in the educational sphere of Lutsk.

Figure 4. Dynamics of education spending ($, USA)



Source: own study, based on data from Lutsk City Council.

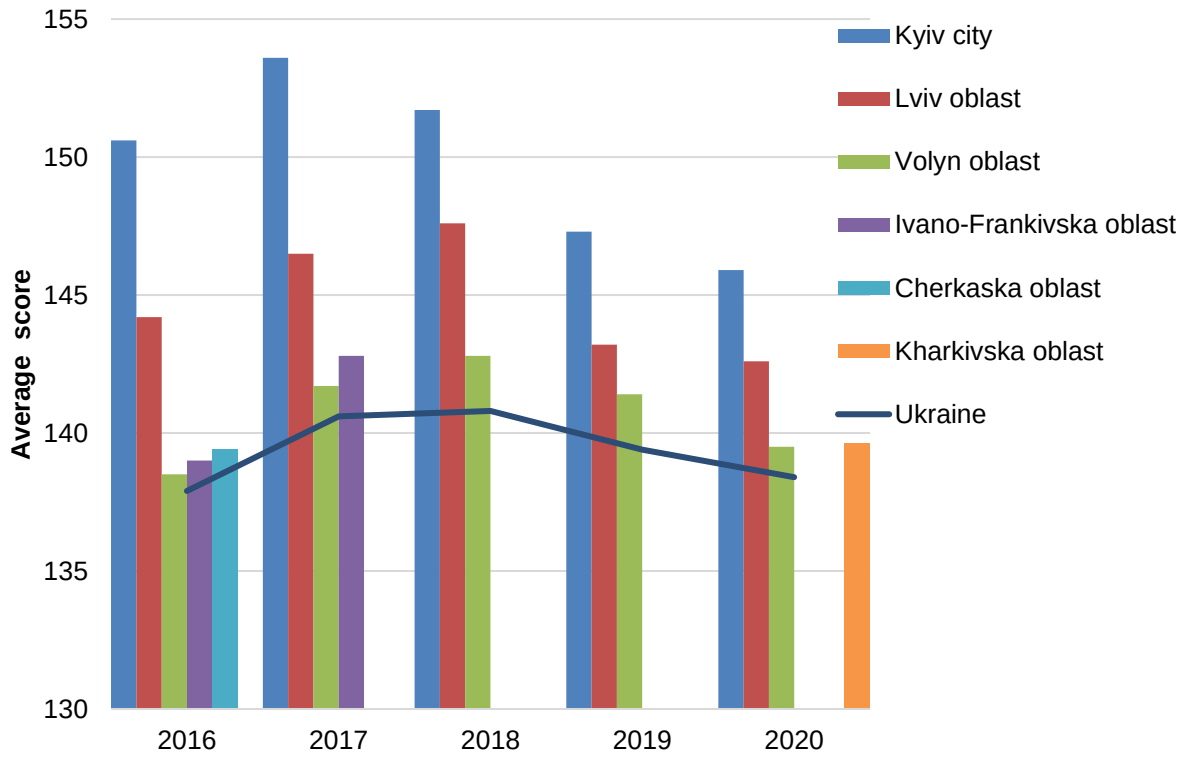
Economic indicators reflect the financing of this sphere with 'residual principle' in Ukraine, which has become the norm under any government in the country.

[6] Source: Lutsk City Council.

Indicators of the quality of school education according to the results of external independent evaluation show that the level of education is higher in the regional centres of Ukraine, and Lutsk occupies a leading position among them. It is important that Volyn Region, being one of the least urbanized territories, demonstrates consistently high results in all school subjects during 2008–2020, and occupying different high positions depending on the subject[7]. It is noticeable that Volyn 'concede' only Kyiv and Lviv Region in knowledge of mathematics and physics (Fig. 5, Fig. 6); if we compare regional centres according to these indicators, the leaders will be Kyiv, Lviv, Kharkiv and Lutsk.

Thorough knowledge of exact sciences is a good basis for the development of innovative economy in Volyn, and obviously, Lutsk does not use this resource too much. The data (Fig. 5, Fig. 6) partially explain why Volyn entrants choose higher education institutions in Kyiv and Lviv, and the EU, in particular, Poland [Klimuk, Penkovska, 2017].

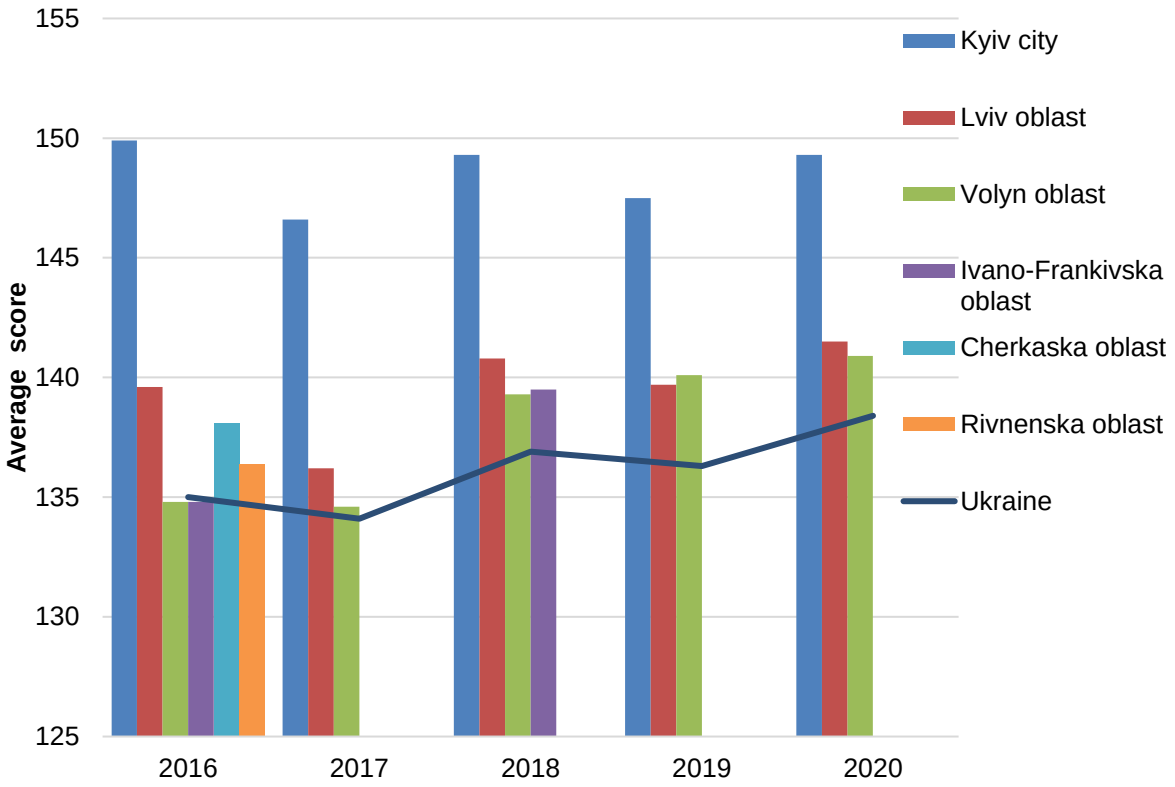
Figure 5. Top-Regions of Ukraine by the external evaluation in mathematics, ave. score



Source: own elaboration, based on open data from [Ukrainian Center…, 2020].

[7] See: statistical data or Official Report from [Ukrainian Center…, 2020].

Figure 6. Top-Regions of Ukraine by the external evaluation in physics, ave. score

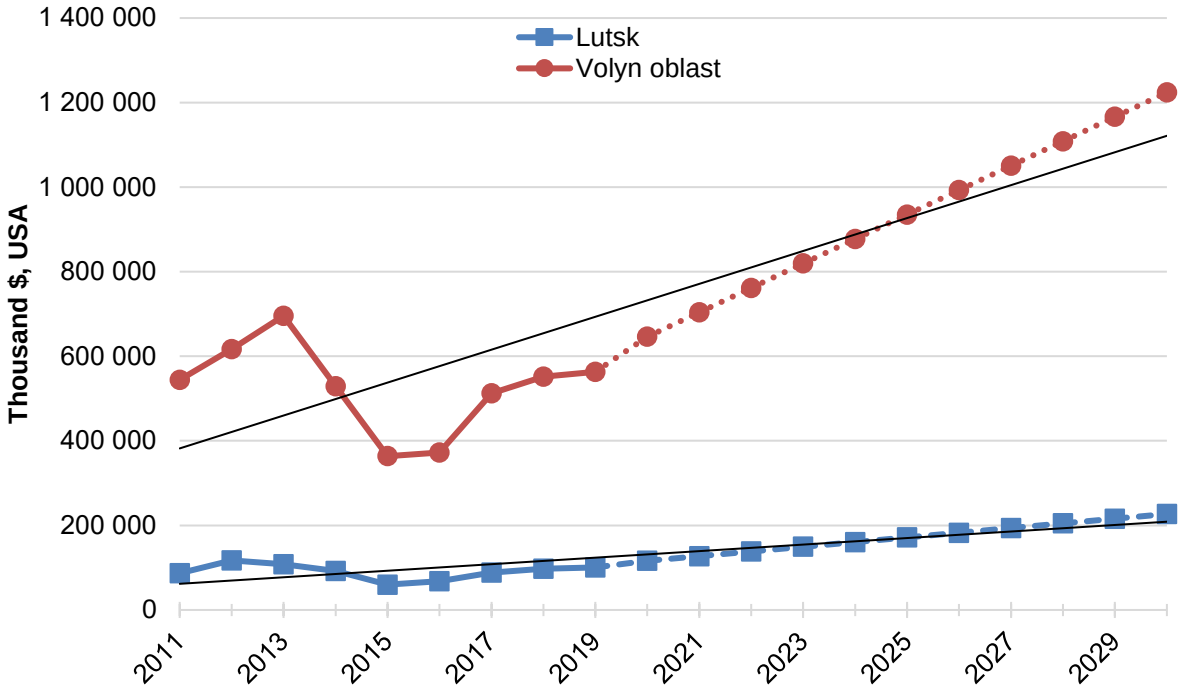


Source: own elaboration, based on open data from [Ukrainian Center…, 2020].

Economic situation

The basis for stable development is the state of the budget. Recent years have shown an average annual growth rate of the total revenues of the city budget at the level of 17.7% ($, USA); this is a positive trend in the development of the city's economy. However, the budget increase is expected to reach the 2012 mark in 2021 (Fig. 7). The forecast of the regional budget is more optimistic (Fig. 7), but in absolute size it is much worse than the urban one, especially considering that the population of the Volyn Region without Lutsk (see Fig. 3) is four times higher than the population of Lutsk (more than 200 thousand [Main Department…, 2019]).

Figure 7. Dynamics of revenues to budgets of Lutsk and Volyn oblast with forecasting



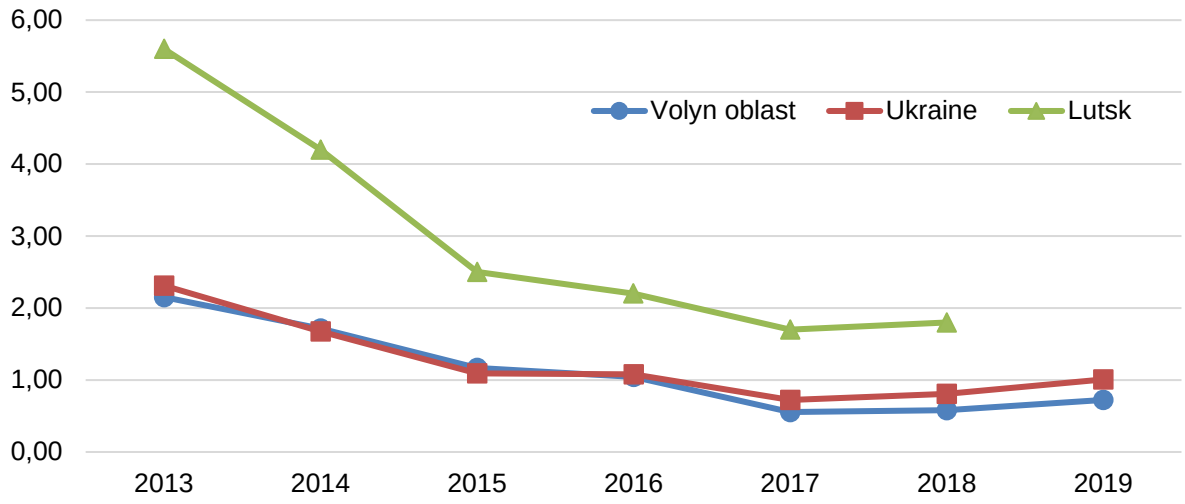
Source: own elaboration, based on data from Lutsk City Council, and [Annual reports…, 2020].

Many large enterprises were officially outside the city until July 17, 2020, and their profit was not reflected in the economic indicators of the city. Nevertheless, the average annual growth rate of sales of one enterprise ($, USA) is 17.1%, and it is an outstripping indicator in comparison with the Volyn Region[8], and Ukraine[9]. There are better conditions for enterprises in the city of Lutsk than in the country as a whole. The correlation coefficient between the revenues to the budget and the volume of realization of the city enterprises ($, USA) is 0.88.

Retail turnover in Lutsk is higher (Fig. 8) than in Ukraine and in the region[10]. This means that a person's low salary is not an indicator of either their well-being or the main source of income, and spending.

[8] See: Volume of sales of products (goods, services) by economic entities by cities and district (2010-2018) [Main Department…, 2019].
[9] See: Volume of sales of products (goods, services) by economic entities by types of economic activity (2010-2018), http://ukrstat.gov.ua/ (14.08.2019)
[10] See: Main indicators of retail trade (2013-2018), Dynamics of average monthly wages by types of economic activity in 2010-2018, http://ukrstat.gov.ua/ (14.08.2019)

Figure 8. Dinamics of retail turnover, thousand USD USA per 1 person



Source: own study, based on data from Lutsk City Council, and [Main Department…, 2019; Annual "Volyn 2019", 2020, p. 35], and State Statistics Service of Ukraine (http://ukrstat.gov.ua/)

Conclusions and recommendations

Considering sustainable development as a process that takes place in three dimensions - social, and economic and environmental, the authors focused on the study of the first two spheres. However, the border location of Lutsk requires studying the process at different levels: local – as a separate territorial unit, regional – as part of the Volyn Region, national – as an administrative unit subject to the legislation of Ukraine, which has declared a course for European integration; and as reflecting the different socio-economic and political conditions in the country, global – as a border area with closer ties with the EU in both social and economic spheres. The authors' attempt to analyze the development-oriented city is complicated by the somewhat late decision of the Verkhovna Rada of July 27, 2020, on the new territorial structure of the regions of Ukraine.

The main problems of the analysis are the lack of statistical data in accordance with the new territorial structure, the uneven development of separate territories, and the impossibility to forecasting the duration and effectiveness in making the necessary management decisions of newly created territorial units, etc. Nevertheless, the analysis of socio-economic indicators in the dynamics, taking into account local, national and European integration contexts, allowed obtaining certain results. For a more complete analysis of the social and economic spheres, the authors used the results of sociological research, regional

and national statistics and open data on the quality of education. To forecasting some indicators, the authors used regression analysis.

The results of sociological research demonstrate the social climate in the city, where the residents associate the lack of social benefits with state-level problems, and think that the development of the region should be in a direction that will provide them with new knowledge, skills, experience, etc., also in regards to the economy and law. Residents of the city felt the demographic problem and the problem of professional realization.

The analysis of statistical data showed that the population aging process in the city and the region does not have such threatening trends as in developed EU countries; and this, as well as the fact that Volyn is not an industrial region, adds optimism. In order to minimize the problem of population decline, local authorities are forced to address the issue of returning older people to the labor market, or support the sectors of the regional economy in which they can realize their experience and potential. Otherwise, this 'potential' will seek to be realized in other more favorable regions of the EU.

This question requires not only the analysis of the labor market and the development of relevant sectors of the economy; it requires programs to maintain the mental and physical health of older people: a way of life aimed at maintaining quality of life; overcoming attitudes and prejudices related to the retirement age, combating ageism (the last elections in the country launched a message of "new faces" regardless of their competence), etc. It is also worth "moving" the discussion at the state level from the topic of reaching retirement age (in years) to the topic of the number of working hours, days, vacations, training, etc. It takes political will to lobby for these interests.

Another problem, the professional realization of the most active and professional population aged 41+, is difficult to solve without an innovative economy. High quality of school education, in particular thorough knowledge of exact sciences, is a perspective resource for development of innovations in Lutsk; but given the problem of highly educated city residents aged 41+, this resource is not fully used by local higher education institutions. City authorities are limited to awarding the best school graduates. As a small border city, Lutsk is a worthy competitor in the field of school education to the largest cities of Ukraine – Kyiv and Lviv, and Kharkiv.

Therefore, a separate strategic mission of the city should be a long-term program for the preparing of specialist for innovative economy. Local higher education institutions are not

able to implement this mission in general (only some elements), successful non-local experience is useful, the world is developing rapidly, local authorities have received "educational powers", business is interested in professionals - all this makes it necessary to turn to the experience of China, now called an economic miracle or a breakthrough in China, but it actually had a long way to go.

The economic situation of the city and the region has a positive development trend. The paradox is that the retail turnover in the city of Lutsk is much higher than in Ukraine as a whole and the region, and the average salary is lower. But, according to data of sociological research, residents of the city were reoriented from the needs of material character to the needs of social, political and professional character.

M. Szabó in sociological research of «differences in behavioral patterns and satisfaction among the generations» considers «regions as social, cultural, political and economic interaction systems which aims maximize the welfare of well-being of residents». She argues «the significance of applying the generation theory into regional strategic planning» [Szabó, 2019, p. 246, p. 229].

«Strategic governance of sustainable spatial development is characterized by fragmentation and lack of coordination» [Pavlikha & Voichuk, 2018, p. 311]. However, the city and regional authorities, all those who manage human resources, should urgently resolve the problem of human capital as the most valuable resource for sustainable development of the city and region. Volyn Region today has enough human resources, but does not care about the quality of this resource. And 'resource' will refocus on the direction of development – Kyiv or the EU – which will provide opportunities for this quality to manifest itself.

Authors' contributions

S. Salnikova proposed the methodology and structure of the article; she analyzed the data in SPSS. She was the head of sociological projects of the Laboratory of Sociological Research of the Lesya Ukrainka East European National University[11], the data of which was used in the article. She also worked with open data from the Ukrainian Center for Educational Quality Assessment, some state statistics. Statistical data provided for analysis by the Lutsk City Council were analyzed by O. Khanin, and he created graphs in Excel, and made a forecast

[11] In 2020, the university returned to its previous title – Lesya Ukrainka Volyn National University.

of some processes; O. Khanin worked also with the state statistics. The interpretation of data and conclusions are the result of mutual discussions of the authors.

Acknowledgment

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Evaluating the effectiveness of investment in human capital in the context of digitalization: Ukraine and the European Union

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Abstract: The effectiveness of entrepreneurial activity is in the ability to provide not only the positive dynamics of financial and economic performance, but also to address the issue of investing in the formation and development of human capital at the enterprise. The purpose of this article is to study the methodological and organizational approaches to ensuring rational investment in human capital in adaptive terms to processes of digitalization of sustainable development of Ukraine and the European Union. Investments in human capital can be made according to several directions: social (voluntary medical and pension insurance of employees, social benefits for certain categories of employees), health care (payment of medical care, preventive measures and medical examination, financing of physical education and sports) and education (covering expenses for the participation of employees in seminars, conferences, and qualification upgrade courses). Although the final indicators of business and education are completely polar, it is reasonable to consider the assessment of investing in human capital in terms of the effectiveness of these processes. To assess the effectiveness of investment in human capital, a number of methods were considered. Our study of the data provided by the Ukrainian public joint-stock companies in the Management Report for 2019 (information posted on the websites of corresponding companies) confirmed the interest of business entities in supporting the policy of investing in human capital.

Key words: human capital, investment in human capital, digitalization of the economy.

JEL: J24, C13, M48, O15.

Introduction

Among the determinative directions of socio-economic development of countries, there is a new paradigm of the theory of "post-industrial society" as a society, the economy of which is dominated by an innovative sector with high-performance industry, knowledge industry, a big share of high-quality and innovative services in GDP, and a higher percentage of population engaged in the tertiary sector than in the industrial production. The traits

of innovative socio-economic development are formed decisively under the influence of high technology, and they need clarification in the assessment of rapid transformations of forms, directions, and consequences.

"Digital economy" or "on-demand economy" – these are the terms that describe modern trends in the development of economic and information relations. In general, these terms identify the type of economy, where digital data, both numerical and textual, are the key means of production. The "digital vortex" created by digital technologies opens up unique opportunities for the development of the state economy and improving the living standards of the citizens.

With a systematic statecraft approach, "digital" technologies will boost the development of an open information society as one of the essential factors needed to increase productivity, ensure economic growth, create jobs, and improve the living standards of the citizens.

The key principles of digitalization in the state economy, which determine its avant-garde nature, are presented in Table 1.

Table 1. Basic principles of digitalization of the economy, which determine its avant-garde nature

Principles	Contents and synopsis of the principles in digitalization of the economy
Accessibility	"Digitalization" should provide every citizen with equal access to services, information and knowledge provided on the basis of information and communication technologies. Removing barriers is a key factor in expanding access to the global information environment and knowledge.
Focus	"Digitalization" should be aimed at creating advantages (benefits) in various aspects of everyday life.
"Growth area"	"Digitalization" is a mechanism (platform) of economic growth due to the cumulative gain in efficiency and increased productivity from the use of digital technologies. Such growth is possible only when the ideas, actions, initiatives and programs related to "digitization" are fully integrated into national and regional development strategies and programs.
Freedom of the press, information. Independence. Diversity of media	"Digitalization" of the state should promote development of the information society, the media, and the "creative" environment. Creating content in accordance with the national or regional needs should contribute to social, cultural and economic development, as well as strengthening of the information society.
Openness and cooperation	"Digitalization" should be oriented at the international, European and regional cooperation in order to integrate into the world community, enter the European and world market of e-commerce and services, banking and stock exchange activities, cooperation and interaction in regional markets.

Standardization	The standards increase competition, allow reducing expenditures and product cost, guarantee compatibility, maintain quality, and increase the state GDP. E-commerce systems, stock and financial markets, etc. must comply with the international and European standards.
Trust and safety	Establishing trust, in particular based on information security, cybersecurity, personal data confidentiality protection, privacy and protection of the rights of ICT users, is a prerequisite for the simultaneous development and security of "digitalization".
Focus and integration	Government control should play a leading role in the development, promotion, and implementation of comprehensive national "digital" strategies. Government control should focus on removing barriers on the way to the "digitalization" of the country, correcting defects in market mechanisms, maintaining fair competition, and attracting investments.

Source: own elaboration, based on Kraus & Holoborodko (2018)

Research on qualitative manifestations in the labor markets of artificial intelligence receives an especially active founding: artificial perception is perceived by many as an engine of productivity and economic growth, a factor in improving the efficiency of decision-making processes, a real chance of analyzing large numbers, etc. At the same time, even today, artificial intelligence confirms the need for careful search for tools that can ensure its socially useful adaptation to economic realities (otherwise, it can have a negative and destructive impact on both the economy and society as a whole).

Therefore, it is impossible to disregard the other side of technological development - people's working capacity, upgrading their qualification. Reduction of jobs, unwillingness of certain professions to compete with technological substitutes for the presence of labor in the workplace, elimination of human "emotional, psychological, aesthetic impact on the finished product, which the buyer in the market expects" – under the modern conditions of economic transformations, these are the objects of profound research.

From the middle of the 20th century, the issues of intellectualization of production, organization and management of intellectual labor have been given more and more attention, since such work not only allows creating and accumulating the intellectual capital, but it also significantly changes the characteristics and value of other kinds of capital (materials, machines, services, business processes). Under the conditions of modern economic orientations, everything indicates that the sources of profitability of an enterprise, ensuring high added value, and increasing competitiveness are not quantitative factors and tangible assets, but knowledge and intangible factors, namely: intellectual, social, and human capital, as well as innovation in marketing and management, which provide conditions and

opportunities for the creation, implementation and use of information and communication, digital and smart technologies.

In our opinion, the existing composition of accounting objects should be expanded at the expense of the so-called "objects of the digital economy", which significantly affect the formation of the financial result - its distribution. Among such objects of accounting, first of all, it is necessary to allocate intellectual capital. In the work of Swedish scientists Leif Edvinson and Michael Malone, "Intellectual capital. Determining the real value of the company", which was one of the first to cover this scientific problem and is recognized worldwide, the components of intellectual capital are human, organizational and client capital [Edvinsson & Malone, 1997].

In the future, human capital will be able to influence the socio-economic climate of the countries that invest in the development of regional infrastructure. From a philosophical perspective, modernization and dynamic development of the state present a systemic change in the physical, institutional, organizational, intangible (intellectual), financial and other factors of its functioning. One can state with confidence that they ultimately lead to a positive economic, social, political, institutional, environmental, and infrastructural outcome [Korchahin, 2016].

Theoretical premises

Formation of human capital as an object of study has been relevant for a long time. Due to this, interest in this economic asset has undergone certain transformations. Adam Smith, Karl Marx, and many other authoritative economists and philosophers referred to this.

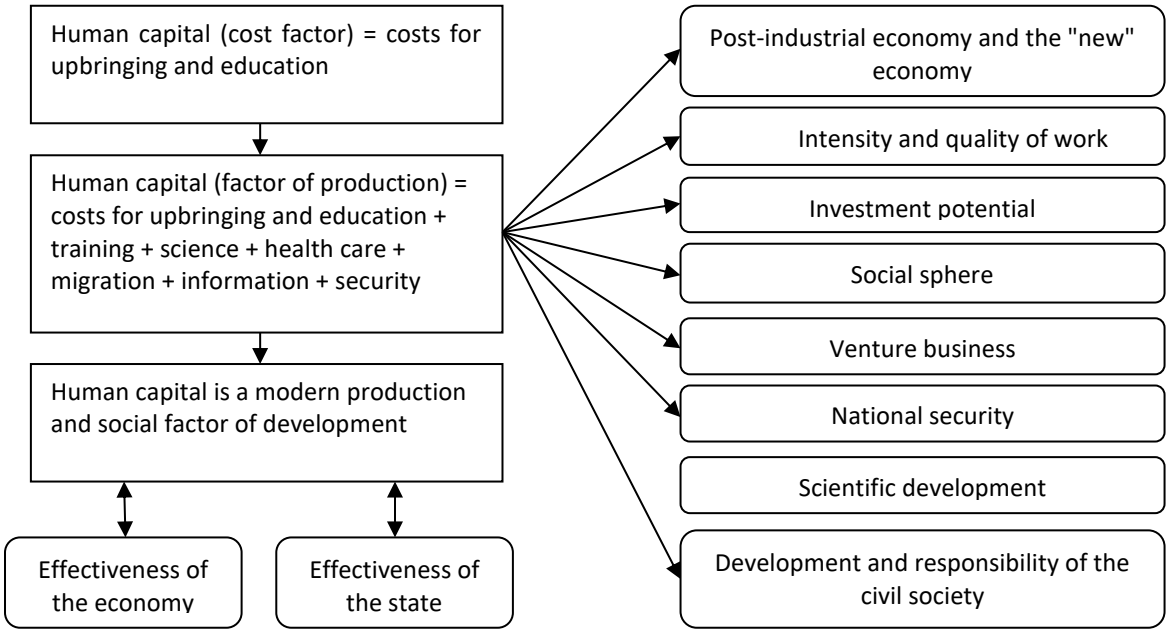
T. Schultz offered various approaches to defining the essence and role of human capital, which made a significant contribution to the formation of the theoretical fundamentals of this concept at the initial stage. It is owing to his research that this economic tool has been rethought and popularized. Schultz defined the role of human capital as a fundamental element of the industrial and, later on, post-industrial economy [Schultz, 1963].

A multi-layered concept of "human capital" at the micro level was suggested by G. Becker in the 1960s. He interprets "human capital" as a set of knowledge, skills and abilities. Expenditures on education and training, according to G. Becker, are investments in human capital development. First of all, he assessed the economic efficiency of education directly for

an individual. The researcher identified the difference in the income of a person with higher education and a poorly educated employee as a potential income difference [Brik & Goreltsev, 2014].

Transformation of approaches to the interpretation of the concept "human capital" in a historical retrospect is shown in Figure 1.

Figure 1. Transformation in the approaches to the interpretation of the concept "human capital" in a historical retrospect



Source: own elaboration, based on Kapkaev & Nurmukhametov (2019)

Following the example of the European Union, modern Ukraine is moving to a fundamentally new type of development - innovative social development based on knowledge, education, intellectual and educational human potential. The country is entering a new phase of formation and application of the human potential, when an increase in the social wealth progressively depends on human abilities to create new knowledge, systematize and generate innovations, design innovative projects, create conditions for rapid economic growth and market development based on dynamic upgrade of the technologies and produced material and spiritual wealth.

The effectiveness of entrepreneurial activity is in the ability to provide not only the positive dynamics of financial and economic performance, but also to address the issue of investing in the formation and development of human capital at the enterprise. The

rationality of building a management system with the use of modern trends in the digitization of sustainable national development encourages managers to seek balanced solutions, obtained on the basis of the results of certain forecast evaluations. Restrictions in the financial support provided to these areas are especially evident today in the context of the just another restriction related to the control of the COVID-19 pandemic. The research offers an alternative to such "management logistics" with the use of complex information content based on the data from analytical studies of progressive business practices in the content of introducing modern systems of production intellectualization.

Methodology

To achieve the goal set in the research, it applies general scientific and special methods based on the systematic study of economic phenomena, namely: systematic and comprehensive analysis, scientific generalization, historical method, comparison and method of analogies – in the study of modern economic theories and works of domestic and foreign scholars on the essence of the concept “intellectualization of entrepreneurship”, “digitalization of sustainable development”; methods of concretization, generalization of theoretical and practical material, analysis – to solve problems in the process of successful investment in human capital; methods of scientific abstraction, a normative method, a method of coefficients, methods of induction and deduction – to form an effective justification for assessing the impact of investing in human capital as an integral condition of present-day business development.

Results

According to the Global Innovation Index (GII), in 2020, Ukraine ranked 45th among 131 countries of the world. And according to the sub-index of innovations, which defines the state of development of human capital and research - 39th place in the ranking [The Global Innovation Index 2020: Who Will Finance Innovation?, 2020].

The increasing attention to the processes of digitalization has been transformed into a significant number of methodological approaches to its evaluation with the use of relevant indices and ratings of countries in terms of the economy digitalization as a whole or its certain aspects only. The most popular indices in the assessment today are:

- The ICT Development Index − IDI: is calculated and made public by the International Telecommunication Union, a specialized unit of the United Nations Organization in the field of information and communication technologies (International Telecommunication Union, 2019);
- Digital Economy and Society Index, DESI: is formed by the European Commission (European Commission, 2019a);
- The IMD World Digital Competitiveness Ranking: is established by the IMD World Competitiveness Center (IMD World Competitiveness Center, 2019);
- Enabling Digitalization Index − EDI: is calculated by the insurance and consulting company Euler Hermes out of the German financial multinational corporation Allianz (Euler Hermes, 2019);
- The Government Artificial Intelligence Readiness Index: is established by the English organization Oxford Insights (Miller & Stirling, 2020) [Vyshnevskyi, 2020].

Among the international ratings and studies of the level of informatization and readiness for the information society and e-government, the most authoritative are the following:

1) network readiness index (NRI);
2) e-government readiness index (EGDI);
3) ICT Development Index (Information and Communication Technologies) (IDI);
4) Knowledge Economy Index (KEI) [Panasiuk 2020].

This list is not exhaustive; nevertheless, it fully confirms the thesis of a fairly large number of approaches to both the assessment of digitalization and the extension of such processes to the human capital modification.

Unfortunately, taking into account the imbalance of budget funds (there are still active military actions in the territories of Ukraine, there are significant deductions from state reserves to control the COVID – 19 pandemic, etc.), it is complicated to specify the reference points of implementing the principles of "intellectualization" in the area of production for Ukraine, compared to the EU countries, although such an ideology is getting more and more popular both at the level of research and at the level of governmental program tasks (Table 2).

Table 2. Characteristics of individual European countries according to the economic complexity and welfare (data for the year 2018) and prospects for economic growth until 2027

Country	Ranking per capita income (out of 133 countries)		Average GDP per capita for the last 5 years, %	GDP per capita for PPP, USD	Ranking of the countries according to the index of economic complexity (ECI)	Forecast of the economic growth until 2027 on the annual basis	
	Income level	Ranking among the richest economies				Growth rate	%
Switzerland	high	1	0.7	66299	2	slow	2.4
Germany	high	14	1.2	52574	4	slow	2.0
The Czech Republic	high	31	2.7	38019	6	slow	2.3
Italy	high	22	0.1	40981	13	slow	1.9
Great Britain	high	19	1.5	44896	14	moderate	3.0
Poland	high	44	3.3	29930	21	moderate	3.1
Norway	high	2	0.6	62182	41	slow	2.5
Turkey	above average	49	4.3	27878	38	moderate	4.64
Ukraine	below average	96	-1.0	8693	42	slow	2.4

Source: own elaboration, based on The Atlas of Economic Complexity (2019)

Simultaneously, it is absolutely inevitable that the high-tech digital economy is being formed both in Ukraine and in the EU countries, acquiring certain identifying features, in particular:

- domination of the information and network sector of the economy over the economy of services, use of new technologies in the production, sales and supplying goods and services;
- rapid development of the companies involved in the development of computer hardware and software, extensive use of information and communication technologies, through which intensive reproduction is achieved;
- an evident change in the living standards among the population as well as the development of quality competition;
- impressive growth rates of the share of services in the structure of GDP.

Among the key problems of achieving success in the field of investing human capital, which would adequately develop and support digital economy in Ukraine, it is possible to highlight the following:

- low technological education, accessibility to the benefits and opportunities of the digital world not equal to all citizens, territorial digital inequality (rural population, low-income people, and elderly age groups are more restricted in the access to the Internet), an insignificant share of innovation in the digital economy (only 17% of Ukrainian industries use innovations, while in the EU this figure reaches 49%);
- obsolescence of equipment in the governmental organizations and structures (Ukrainian private IT companies can afford having the latest equipment, while the governmental agencies as well as small and medium-sized businesses are limited both in technologies and finance);
- low level of state support for modernization of fixed assets into digital ones, weak progress in approaching the key achievements identified in the harmonization of digital markets by the document "20 Anticipated Achievements of the Eastern Partnership by 2020", lack of an agreed strategic approach to establishing the policies of digital market harmonization with the EU [Zhekalo, 2019].

Investments in human capital can be made according to several directions: social (voluntary medical and pension insurance of employees, social benefits for certain categories of employees), health care (payment of medical care, preventive measures and medical examination, financing of physical education and sports), education (covering expenses for the participation of employees in seminars, conferences, and qualification upgrade courses), etc.

It is problematic to assess the effect of these investments as there is hardly any quantitative indicator for the mentioned categories. This raises the question of how effective it is to assess investment in human capital.

Unfortunately, the problem of assessing investment in human capital is the subject of discussion for both business entities and educational institutions, which provide training of the personnel to provide them with appropriate digital skills and competencies. Although the final indicators of business and education are completely polar, it is reasonable to consider the assessment of investing in human capital in terms of the effectiveness of these processes.

Herewith, based on the economic aspect of the efficiency indicator, it is recommendable to analyze efficiency as a consequence of comparing incomes / economic benefits as a result of investing in human capital with corresponding costs (based on the classical formulas pf efficiency).

The alternative and relatively simple methods of assessing the effectiveness of investment in human capital comprise the "methodology of O.G. Vaganyan" (equation 1):

(1) $$Z = \frac{X_e - X_b}{Y}$$

where *Z* - the investment efficiency ratio; X_e - the amount of human capital at the end of the reporting period; X_b - the amount of intellectual capital at the beginning of the reporting period; Y - the cost of investment in human/intellectual capital of the entity (enterprise, educational institution) - that is, investment in intangible assets [Kovelskyi & Rostova, 2020].

The amount of human capital is calculated as the difference between the capitalization of the entity and the replacement price of its real assets, with liabilities excluded. In particular, calculating the investments in intangible assets takes into account the costs of: research and development; education, qualification upgrade, employees' health promotion, social investment; information technologies, information coverage, technical support and software, formation and development of the brand; creation of a corporate portal, website; marketing; acquisition, dissemination, storage of information; development of distribution; development of corporate culture; acquisition of know-how, patents, other types of intellectual property.

Another alternative to assessing the investment in human capital of the organization is a fairly simple and clear "Alaverdian methodology" (equation 2) for commercial organizations [Alaverdian, 2017]:

(2) $$S = W * G + I * t$$

where S is an estimated value of the employee (the usefulness potential of such labor resource); W – salary of the employee; G – goodwill of human resources of the employee; I – cost of investment; t – the period of investment.

The application of the method of comparative analysis of the operating environment (Data Envelopment Analysis, DEA) is quite effective and informative for assessing the effectiveness of investing in human capital. The DEA method is based on the construction

of the so-called efficiency limit in the multidimensional space of input and output variables describing the objects whose efficiency needs to be determined. According to the DEA methodology, the objects being evaluated must operate in the same environment and, in the process of producing goods or services, transform the same set of input resources into the same set of output products. Whereas, this method is not parametric, instead of assuming a functional relationship between input resources and output products, a system of flexible weighted averages is used. The use of non-fixed weighted averages minimizes the risks of subjective evaluation by the research analyst.

The analyst obtains the optimal value of input and output indicators based on the results of the evaluation of the efficiency of investment in human capital using the DEA method. The management of the facility decides to increase or decrease the input or output indicators in order to achieve the level of efficiency, because there are other objects, real or hypothetical, that function optimally. Thus, DEA is not only a method of evaluation, but also a method of management, which is especially important in relation to the problem under study.

When applying the DEA method to assess the effectiveness of investment in human capital, a linear programming model is developed for each object, the effectiveness of which will be evaluated, and has the form:

(3) $$\min E$$

with restrictions for input indicators:

(4) $$\sum_i W_i \times X_i \leq X_0 \times E$$

with restrictions for output indicators:

(5) $$\sum_i W_i \times X_i \geq Y_0$$

with restrictions for weighted averages:

(6) $$\sum_i W_i = 1$$

where E – is the coefficient of efficiency of the object of study;

W_i – weighted averages;

X_i – indicators at the entrance of all objects under consideration;

X_o – indicators at the input of the object, which is assumed to be inefficient;

Y_i – output indicators of all considered objects;

Y_o – is the output of an object that is assumed to be inefficient. The condition $E, Wi \geq 0$ must also be satisfied.

To assess the effectiveness of investing in human capital of the enterprise according to the DEA method, the input indicators can be: total investment in human capital, the number of employees involved in the investment process. The output indicators include both financial and non-financial factors: the amount of net income, the amount of profit, reducing labor costs, increasing productivity, increasing the competence of employees, acquiring new professional skills and more.

Research in the area of results of investing in human capital confirms that currently there are no effective methods of assessing the return. Although there has been an insignificant improvement in certain years in favor of investment in human capital, less than 1% of investment aimed at increasing the value of human capital as a share of total operating expenses is a low value for the company. This can be explained, for instance, with a short period spent on the market and prudence of the company when making decisions on the investment projects. There is no doubt that in the current competitive environment of information technology and e-business, low level of investment in human capital can weaken future competitiveness of an enterprise.

Sociological research conducted in the EU member-states demonstrates that the scope of reward for the work completed by specialists who have mastered digital technologies is relatively high. In 2017, the rate of staff training as a percentage of income reached 14%, and compared to the year 2012, it increased by more than 12%.

Our study of the data provided by the Ukrainian public joint-stock companies in the Management Report for 2019 (information posted on the websites of corresponding companies, the reporting of 25 companies was studied) confirmed the interest of business entities in supporting the policy of investing in human capital. The non-financial indicators include: updating and modernization of information technologies, training and retraining of specialists involved in the maintenance of modern software products, material motivation to improve competencies and acquire high professional skills, generalized assessment of business investment policy (see Table 3).

Table 3. Results of a sociological study of non-financial information in the Reports on the management of domestic enterprises-issuers of securities

No.	Groups of nonfinancial information	Information Content	Share in non-financial indicators of the Report (%)
1	2	3	4
1	competitiveness of production	modernization of information technologies, growth rates in sales of a certain type of products or services; size and composition of the client base; market share and its increase; structure of software and product portfolio, etc.	6
2	activity level of technological processes	number of units of already sold finished products; hours worked; number of transported passengers; dynamics of activity in the course of the year, etc.	7
3	performance	production costs per unit; level of workload and automation of working capacities; average daily or hourly output, etc.	12
4	level of personnel professionalism	average level of rotation; number of hours of training, courses, or qualification upgrade received by employees; job satisfaction assessment; average working time of an employee in one position; the level of competitiveness of wages, etc.	14
5	social responsibility of a business	implementation of social programs, material motivation to increase competencies and professional skills	13
6	environmental safety	effectiveness and efficiency of measures taken to prevent and reduce the harmful effects of performance outputs on the environment, enhancement of the safety system in the workplace, etc.	8
7	level of corporate ethics	evaluation of communication effectiveness: professional support and respect, constructiveness and objectivity of management decisions, etc.	9
8	innovations	status and immediate prospects of production development; evaluation of the policy of technological equipment modernization, search for new innovative production technologies, expansion of the sales market	7
10	standing of the company	market position, brand value; share of consumers willing to accept a marketing offer; ratings according to independent experts, etc.	7
11	information on the enterprise development	state and immediate prospects of production development; assessment of business investment policy, search for new innovative production technologies	17
	Total		100

Source: own elaboration, based on public financial statements.

The following tasks have priority on the way to digitalization of business entities:

- improving the material factors of digital technology implementation: technical component (computers, network infrastructure programs) and uninterrupted Internet access;
- low digital competence and digital literacy of software and digital products users.

Strategic documents currently developed at the governmental level in Ukraine will define the vision with clear understanding of the transformation in information and computer technologies for the following 15-20 years, a resource plan for "digitalization" and research to evaluate the success of transformation processes.

Optimization of the processes of human capital investment as a powerful innovation and production resource of the present-day labor market implies providing state support to the following aspects:

- conducting independent qualitative and quantitative studies of the available digital skills in different population groups;
- development of the list of priorities in the required digital skills and competencies;
- review and update of the training programs for the staff;
- development and promotion of generally available online and offline digital literacy courses;
- introduction of the principle of mandatory digital competencies for employees;
- popularization of the importance of digital literacy among the population, etc.

Summary

As of today, it has become obvious not only at the hypothetical, but also practical level that every business entity, regardless of its organizational and economic structure, regional affiliation or chosen strategy, must undergo a digital transformation, which implies not only mandatory implementation of modern information and communication technologies, but also continuous organizational and cultural innovations.

The results of the conducted study confirm that application of "digital" technologies in practice is currently one of the most important and sustainable business trends. The digital trends in training and development of the staff imply provision of technical means, formation of the appropriate software and digital infrastructure, user training, etc.

Introduction and use of digital technologies in the enterprises will have many benefits, including: expansion of the employees' functions, which will allow processing of a large array of information, facilitation of searching for information, application of the latest advances in industrial development, quick responding to inquiries, tracking all news and trends online. Further research should be aimed at choosing and justifying alternatives to digitalization of domestic enterprises in view of the needs of national socio-economic development, as well as financial and resource provision by expanding the methods of training and development of human capital at the enterprise.

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Substantiation of the project of development of charging stations network for electric cars

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Abstract: Today, the global world market is slowly but surely and systematically developing a crisis in the extraction, processing and use of light hydrocarbons, i.e. oil and gas. It has two aspects, in particular the cost of extracting these energy sources is constantly increasing, as deep drilling of wells on land, seas and oceans is required, and the increasing combustion of these hydrocarbons pollutes the environment, contributing to global climate change. In addition, the latter has a very negative impact on human health, which requires considerable funds for their treatment, in particular, and leads to global extinction of both animals and humans in general.

An alternative to light hydrocarbons for refueling and moving cars at the moment is electricity. After all, in addition to nuclear energy, alternative "green" energy has been intensively developed recently, which is generated by the energy of the sun, wind, water, organic compounds and household waste.

According to the results of the analysis of the dynamics of electric vehicles supply to Ukraine and construction of electric charging stations for their power supply, it was established that this type of transport moves 2.25 times more intensively on the market than building of electric charging stations. This slows down the promotion of this mode of transport in the country and does not reduce the consumption of traditional fuels, including gasoline and diesel fuel. Therefore, the article is devoted to the development of the concept of building a national network of charging stations by 2025, with serial production of 200 units per year, which is based on the capabilities of the company "Elekar Group" LLC. It is substantiated the project of production of electric charging stations, which is based on the deep analysis of the market, applying M. Porter's model of competitiveness, SWOT-analysis and analysis of a life cycle of production. A conceptual model for diagnosing the competitiveness of charging stations has been developed.

Key words: circular economy, sustainable development, closed ecological and economic cycle, economic and mathematical methods and models

JEL: O1, O2, O3, O4, M1, M2

Introduction

Today, the global world market is slowly but surely and systematically developing a crisis in the extraction, processing and use of light hydrocarbons, i.e. oil and gas. It has two aspects, particularly the cost of extracting these energy sources is constantly increasing, as deep drilling of wells on land, seas and oceans is required, and the increasing combustion of these hydrocarbons pollutes the environment, contributing to global climate change. In addition, the latter has a very negative impact on human health, which requires considerable funds for their treatment, in particular, and leads to global extinction of both animals and humans in general.

An alternative to light hydrocarbons for refueling and moving cars at the moment is electricity. After all, in addition to nuclear energy, alternative "green" energy has been intensively developed recently, which is generated by the energy of the Sun, wind, water, organic compounds and household waste.

As mentioned above, due to the development of nuclear energy and alternative sources of its generation, today this type of energy is already competing in price with light hydrocarbons, and given its impact on the environment, it is generally the most promising type of energy. In particular, fast neutron reactors are being built in nuclear power, researchers are already solving problems of controlling the influence of solar radiation intensity in solar generators, and the latest generators are entering hydro and air power due to the use of nanotechnologies in the production of new materials and 3D printers for turbines production [1-8]. Ukraine has sufficient capacity of generating power and in general its energy sector was built while taking into account the discrete selection of capacity during peak hours.

Today, developed countries plan to convert the passenger car market to electric cars by 2025. Ukraine is also joining this project, as in 2018 it introduced excise-free import of electric cars into the country. In addition, the project of the Zaporizhia Automobile Plant "Komunar" is planned to be introduced in the near future in the serial production of electric cars. At the same time, if there are no problems with electricity generation in Ukraine, there are many technical and economic issues with its distribution. After all, electricity distribution systems were built in Soviet times and are concentrated near large energy-intensive enterprises. Thus, summarizing the above, it can be noted that there are almost all resources

for the introduction of the electric car market in Ukraine, but there is almost no network of gas stations for this type of transport.

Therefore, the aim of the article is to develop the concept of building a network of electric charging stations in Ukraine, which is based on the "Elekar Group" LLC company's capabilities for the production and sale of charging stations for electric vehicles. Thus, for the development of ecological transport in Ukraine, we consider it necessary to apply an integrated and systematic approach, ensuring the availability of electric vehicles for the consumer and the corresponding infrastructure.

Theoretical premises and methodology

For the development of ecological transport in Ukraine, it is necessary to apply an integrated and systematic approach, ensuring the availability of electric vehicles for the consumer and the corresponding infrastructure. The комплексный analysis of the electric car market in Ukraine performed according to the method [9-11] showed that its growth is constrained by the lack of a developed network of charging stations. In particular, the number of public stations at the end of 2020 was 2719 units. At the same time, among these charging stations, there are those that serve only electric cars of their own production. This further complicates the problem of charging cars.

The depth of this problem can be understood from the analysis of such data. In the first half of 2020, 3,384 new electric vehicles were registered in our country. This is 16% more than in the same period last year. And as in the end of 2020, almost 23,000 electric cars and slightly more hybrids have been registered, which together make up about 46,000 cars. The presented statistics show that the growth rate of the number of electric cars in Ukraine is significantly higher than the charging stations for their maintenance. In addition, according to Ukrainian law, electric chargers can be placed only on roads of state importance, which are 46.6 thousand kilometers. And the requirements for the number of gas stations on local roads, which are 117 thousand kilometers, are not defined. This limits the ability to travel on this mode of transport in the country. At the same time, it should be noted that most electric charging stations manufactured in Ukraine have a whole system of superstructures for the process of charging cars. In particular, it is the use of magnetic cards, registration in certain systems and the creation of accounts and more. Therefore, «Elekar Group» LLC develops

charging stations without using complex interfaces and reducing the number of options. At the same time, this company has developed software that allows the operator to track all processes at the station while charging cars.

The main goal of «Elekar Group» LLC is to create a single national network of charging stations with serial production of 200 units per year by January 1, 2025. The construction of its own global network of charging stations for electric vehicles will provide an opportunity to improve the infrastructure of electric vehicles in Ukraine and will help create additional opportunities for users of electric vehicles to charge anywhere. This will increase the demand for electric cars in Ukraine. At the same time, increasing the number of electric vehicles in Ukraine will help reduce its dependence on oil and gas supplies. In addition, it should be noted that this trend will help improve the environmental situation in the country as a result of reducing CO2 emissions. It is also worth paying attention to the reduction in the air and on the ground of heavy metals from the combustion of hydrocarbons used by gasoline and diesel vehicles.

«Elekar Group» LLC can implement the above project to build an extensive system of gas stations, investing in it about 10.6 million UAH. The payback period of the project will be only thirteen months.

To assess the company's capabilities in this market, we use SWOT-analysis (Table 1), analysis of the life cycle of these products and assessment of the competitors' capabilities [9-13].

Table 1. Analysis of the advantages and disadvantages of «Elekar Group» LLC

Strengths	Weaknesses
• high quality products; • technical support from equipment suppliers; • creation of infrastructure by own forces; • use of innovative technologies in developments; • product patents; • high qualifications of the company's employees; • quality service; • competitive price for products and services.	• low production volumes; • insufficient quality and quantity of advertising of own products; • lack of European certification; • lack of working capital.
Opportunities	Threats

• increase in the product range; • production of fast car charging stations; • increasing the network of charging stations; • attracting additional investments; • increase of the distribution network in Ukraine and abroad; • start of a powerful advertising campaign.	• the initial stage of development of the electric car industry; • low education of the target audience; • increase in the price of electrical equipment; • imperfect legislation.

Source: Authors' calculations

The qualification of employees and its impact on product quality was assessed according to the method proposed in the works [9-13].

Results

It is known [9-13] that there are four stages of the product life cycle, in particular:

- entry of goods into the market;
- growth;
- maturity;
- decline.

The period of growth is characterized by a rapid increase in sales and revenue. Thus, given that the demand for electric cars in the world and Ukraine is growing rapidly, these products today and in the medium term will be in growth.

The analysis of the market of electric charging stations in Ukraine showed that the following companies work on it:

Table 2. Number of charging stations and shares of operators

Stations	Number
Number of standard and high power stations, 2719 in total	
AutoEnterprise	1113
IONITY	387
ElectroUA	380
TOKA	204
Green Fuel	200
Elekar Group	103

Eco-Factor Charge	81
Go To-U	63
RV-Net	60
E-Line	45
Yasno	23
Electro.vn.ua	21
ChargeX	13
Quick Power	11
UGV Chargers	11
ChargeU	2
Electrocars	2

Source: https://fra.org.ua/ru/st/statistika

Identifying one's own advantages over competitors will usually help increase sales and increase profits and master new market elements. To do this, these benefits need to be brought to the attention of consumers so that they are clearly oriented among a wide range of similar products and services.

To assess the competitiveness of products and services of companies for the production of charging stations, the authors proposed a criterion that reflects the rate of change of technical and economic parameters of the product of companies depending on the development of the industry. To do this, a conceptual model for diagnosing the competitiveness of charging stations (Fig. 1), the components of which are calculated based on the marketing concept

(1) $$V=f\{Pi\,\alpha_i\},$$

where V is the sales volume;

Pi (i = from 1 to 4) - marketing mix;

α_i - the weight of the parameter in the marketing mix.

Price (P_2),

$$P_2 = \sum_{i=1,n} N_i * a,$$

parameters
N1, N2…Nn

Product (P_1),

$$P_1 = \sum_{i=1,n} N_i * a,$$

parameters
N1, N2…Nn

$$Z_s = \sqrt[4]{P_1 * P_2 * P_3 * P_4}$$

Sales system (P_3),

$$P_3 = \sum_{i=1,n} N_i * a,$$

parameters
N1, N2…Nn

Marketing communications, (P_4)

$$P_4 = \sum_{i=1,n} N_i * a,$$

parameters
N1, N2…Nn

According to experts, in assessing the competitiveness of charging stations, the value of the significance level (α_i) of each parameter is distributed as follows: α_1 = 0.30 (range); α_2 = 0.20 (price); α_3 = 0.25 (sales system); α_4 = 0.25 (marketing communications)

(3) $$\alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 = 1,$$

where α_i is the value of the significance level of the parameter.

The basis for determining the significance of each parameter is expert assessments based on the results of marketing research.

A comparative analysis of the parameters that directly affect it was conducted, as such a procedure is important for competitive marketing. The results of the comparative analysis are presented in Table 3.

Competitiveness parameters were compared with «AutoEnterprise», as it is the leading company in this market.

Table 3 Assessment of the competitiveness of companies

Company	Parameters																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
«Elekar Group»	8	7	9	6	8	8	6	7	9	8	9	8	9	9	8	7	7	8	5
«AutoEnterprise»	8	8	5	9	8	7	7	7	7	8	8	8	9	9	7	7	7	7	6

Source: own compilation based on https://fra.org.ua/ru/st/statistika

in paragraphs № 1… 14, Table 3 presents an estimate of the parameters that characterize the product, and in paragraphs № 15… 19 - its price. In particular, № 1 is quality, № 2 is brand, № 3 is uniqueness, № 4 is versatility, № 5 is technical parameters, № 6 is characteristics during use, № 7 is multivariance in use, № 8 - overall dimensions, № 9 - legal possibility of product replacement, № 10 - level of repair service, № 11 - service life, № 12 - warranty period, № 13 - reliability, № 14 - patent protection. Thus, the parameters that characterize the quality of the product in the company «Elekar Group» is 112, and «AutoEnterprise» - 107. Therefore, according to this indicator, the first company produces a slightly better product than the second.

The parameters that characterize the price of the product are as follows: № 15 - price list, № 16 - percentage of discounts, № 17 - preferential discount, № 18 - terms and conditions of payments, № 19 - loan terms. Thus, according to the data (Table 3), both companies have almost the same position on this indicator, as in the first company this indicator is 35, and in the second - 34.

The competitiveness of these companies was also assessed on such grounds as sales channels and product promotion in the market. Sales channels and market promotion were evaluated on eleven indicators. The sales channel on the market for the second company is estimated at 74, and the first - 72 points. However, for the promotion of products on the market, the first company was rated at 87, and the second - 74 points.

The overall assessment of competitiveness, using a conceptual model for diagnosing the competitiveness of charging stations, for the company «Elekar Group» is -17.59 and «AutoEnterprise» - 16.47. Thus, the products of the first company are more competitive than the second.

The analysis of this information and its reasonable interpretation allows experts to assess each parameter that determines competition, as well as to characterize the general condition of the company and its place in the market.

Porter's analysis of the five forces adds objectivity to previous conclusions. In particular, to assess the market, we analyzed the threats to the emergence of substitute products, new producers and suppliers, assessed the market ownership of suppliers and consumers and determined the level of competition [19].

Analysis of suppliers of materials and components is a very important aspect. After all, low-quality materials and components will contribute to the non-compliance of products with regulatory and technical documentation for their production. Complaints about the low quality of products will lead to direct losses of funds to eliminate non-conformities or even to replace products with those that meet the regulatory and technical documentation for their production. In addition, the unstable quality of materials and components will contribute to the unstable quality of the final product, which will lead to a loss of reputation in the market and to the loss of markets. Therefore, the international quality standard ISO 9001 provides a separate procedure as "supplier evaluation". Assessment of the quality of processes, in particular the process of "supplier evaluation", is devoted to works [9-18]. In particular, the approaches to process evaluation represented in these works were used by us to evaluate suppliers of materials and components.

In particular, the following requirements were set for the suppliers:

- delivery of products in time defined by contracts and quality, which corresponds to the parameters of regulatory and technical documentation for its production and specified in the contracts;
- observance of volumes of deliveries of production and its complete set;
- long-term warranty periods for materials and components;
- prompt response to complaints of non-compliance with contractual obligations;
- compliance with agreed prices;
- accessibility (territorial, informational, communication) to suppliers.

To achieve this goal, the company has developed a marketing strategy. It consists of the following factors:

- product distribution scheme;

- pricing;
- advertising;
- methods of sales promotion;
- organization of after-sales service of products;
- organizational plan;
- production plan;
- risk assessment and insurance;
- investment plan;
- calculation of the annual economic effect.

These factors, which determine the marketing strategy of the enterprise to achieve this goal, were fulfilled with specific steps, which are justified by the calculation of material costs. In particular, the focus should be on the production plan, risk assessment, financial plan, investment and calculation of the annual economic effect.

The development of a production plan begins with the calculation of the number of workers. They were usually based on production volumes, number of technological operations and their labor intensity. In particular, the number of workers was determined by formula (4):

(4) $$R_i = V \cdot T_i / F \cdot Q.;$$

where:

Ri - the number of workers in each technological operation;

V - volume of output, one;

Ti - the complexity of the i-th operation, n / year;

F. - current annual working time fund, F. = 1800 hours;

Q. - performing norms coefficient, $C_{p.n.}$= 1.

The desired area was determined by formula (5);

(5) $$St = Sp + Sa;$$

where:

St - total area of the district, m^2;

Sp - production area of the district, m^2;

Sa - auxiliary area of the district, m^2.

Production area was calculated by formula (6):

(6) $$Sp = N \bullet P;$$

N - the number of jobs at the district;

P - area per workplace, which was 8 m^2.

Calculated according to formulas (2; 3), the total area of the production district was 32.4 m^2. At the same time, the cost of renting the premises was calculated based on the cost of 1 m^2 of 34 UAH per month.

Taking into account the determined costs for the lease of the production district that was calculated according to the above formulas, the cost of materials and components, basic and auxiliary wages, overhead costs, mandatory payments to the budget, the cost of production was calculated. At the same time, together with the planned profit, the cost of production was calculated. All calculations of the cost of production were performed according to the standard current method, so they are not presented in the article, as they have intermediate character.

Risks are possible during the creation of this production and its operation. In particular, they may be related to the following factors:

- Untimely supply of raw materials and components. To prevent this, the company needs to have several suppliers for each unit of raw materials, etc.
- Rapid inflation. To minimize losses from it, the cost of production should be slightly increased, based on expert forecasts.
- The emergence of competitors in the market. It is necessary to take into account the pricing policy of competitors and improve the quality of its products and its properties to satisfy consumers in order to expand markets.
- Components for charging stations are manufactured abroad. Therefore, their price is pegged to the exchange rate of the main foreign currencies: the US dollar and the euro. It is clear that fluctuations in the hryvnia exchange rate against these currencies will usually contribute to rising prices for electric charging stations. To minimize price growth, it is necessary to reduce the cost of production, taking into account all the main factors that determine it.

To implement the program for the production of gas stations and create their network, the financial plan has been developed based on projected production volumes. They are given in the following table (Table 4).

Table 4 Projected volume of product sales

Term of production, year	Production volume, units	Production volume, UAH.
1	200	6,996,338
2	400	13,992,676
3	600	20,989,014
4	800	27,985,352
Total	2000	69,963,379

Source: Authors' calculations based on enterprise «Elekar Group» LLC data

The minimum amount of financial resources that companies need to produce the planned volume of production is defined as the ratio of annual operating costs to cash flow. It is determined that the planned production program requires UAH 433,483.2 ($ 169,88.8). At the same time, the critical volume of production at which the company receives zero profit is calculated. According to calculations, the critical amount of the minimum volume of production is 140 units per year. It was calculated by formula (7):

$$N_c = S_{ctc} / Pri - S_{ch}; \quad (7)$$

where:

S_{ctc} - conditionally fixed costs for the entire volume of production (4,484,832 UAH);

Pri - unit price (UAH);

S_{ch} - change in loss per unit of output, (UAH 2,976,6).

The calculated gross income is UAH 157,529,262 and the need for working capital is UAH 3,470,226.3. They are calculated according to standard methods.

The investment program for the production of the planned volume of gas stations is given in Table 5.

Table 5 Investment program

№	Stages	Including, UAH		Total UAH
		Year I	Year II	
1	Premises for rent	67,740	67,740	135,480
2	Acquisition of office equipment	40,000	20,000	60,000
3	Repair of office premises	37,600	30,000	67,600
4	Purchase of vehicles. Electric car - 1 unit.	40,000	40,000	80,000
5	Working capital	3,470,226.3	-	3,470,226.3
	Total	3,587,842.3	105,536	3,693,378.3

Source: Authors' calculations based on enterprise «Elekar Group» LLC data

The calculation of the economic effect (Ee) was determined by formula (8):

(8) $$Ee = Prb \bullet a - (Pr + En \bullet La) + ((Ub - Un) - En \bullet (Kn - Kb)))/Pam;$$

where:

Prb - the price of the base product, UAH;

a - equivalence coefficient;

Pr - the minimum price of a new product, UAH;

En - normative efficiency ratio of capital investments (0.15);

La - additional costs, UAH;

Ub, Un - annual operating costs of the consumer, UAH;

Kn, Kb - accompanying capital investments of the consumer, UAH;

Pam - coefficient of depreciation calculations;

Ee = 127,439.2 · 12.4 - (73,038.33 + 0.15 · 114,150) + (574 – 0.15 · (- 23,486)) / 0.154= UAH 114,857.3

The planned volume of production due to insufficient funding can be reduced by 14 units.

Conclusions

For the transition to ecological transport in Ukraine, it is necessary to create systemic conditions at the macro and micro levels. According to the results of the analysis of the electric

car market in Ukraine, it was determined that its rapid growth is hampered by the lack of appropriate infrastructure, in particular the required number of charging stations for their power supply. Thus, for the development of ecological transport in Ukraine, we consider it necessary to apply an integrated and systematic approach, ensuring the availability of electric vehicles for the consumer and the corresponding infrastructure.

A project has been proposed for building a national network of electric charging stations until 2025, with serial production of 200 units per year, which is based on the capabilities of the «Elekar Group» LLC company. Calculations confirmed the economic attractiveness of this project and its prospects for the next 5 years. The conceptual model of diagnostics of competitiveness of charging stations is developed and the criterion which reflects speed of changes of technical and economic parameters of a product of the companies on manufacture of charging stations depending on indicators of development of branch is offered.

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Assessment of the Impact of Macroeconomic Factors on Wage Formation in a Market Transformation of Ukraine's Economy

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Abstract: An assessment of the impact of macroeconomic factors on wage formation in conditions of market transformation of Ukraine's economy has been performed. The factor analysis of indicators has been carried out. The main factors of earning power in the Republic of Poland and Ukraine are compared. The main problems of state regulation of wage setting in Ukraine are revealed. The measures to improve macroeconomic regulation of the wage process and increase macroeconomic indicators have been proposed.

Keywords: wages, income, GDP, labor productivity, consumer price indices, exchange rate dynamics.

JEL:E 240, H 550

Introduction

The transformations that have taken place in the economy of Ukraine are deeply connected with the need for reforms in the field of wages in order to strengthen the motivational function of wages and, accordingly, increase the efficiency of management. Labor relations in Ukraine have long been based on volatile and subjective wages. The deformation in the field of wages has now reached such a scale and depth that wages have actually become a kind of "social assistance", ceasing to be the main value in society and the basis of its economic and social development. Large differences between the market status of the labor force and largely non-market methods of evaluating results undermine the foundations of the market system and lead to lower living standards of the general population, falling real incomes, increasing property differentiation, shadowing the economy. Therefore, the study of wages and the ways to increase wages is of particular importance today.

The purpose of the study and methodology

The main purpose of the study is to assess the impact of key macroeconomic factors on wage formation in a market transformation of Ukraine's economy. Legislative and regulatory acts of Ukraine, materials of the World Bank, the European Statistics Service, the State Statistics Committee of Ukraine, the Ministry of Economy, the Ministry of Labor and Social Policy were used for this purpose. The information basis of the study was also the work of domestic and foreign scientists, official Ukrainian and foreign statistical materials, data of international organizations, the results of sociological surveys, etc.

The work uses a number of general and special research methods: abstract – logical – in the study of the essence of categories and concepts of wages; comparative – economic – in the analysis of domestic and foreign experience in regulating wages; statistical and method of economic analysis – to process an array of statistical and empirical data to assess the situation and retrospective analysis of wages in Ukraine.

Research issues

There is no doubt that at the present stage, there is a need to further study the directions of reforming the wage system. The problems of wage differentiation as the value of the marginal product of labor and the development of proposals and recommendations for improving the efficiency of state regulation of wages in the economy of Ukraine has come to the fore. In the analysis of the labor market, of particular interest is the process of decision-making to determine the optimal volume of labor demand as an economic resource. Thus, a firm that seeks to maximize its profits usually must take into account the possible volume of resource use, the value of the total product at appropriate levels of labor costs, and marginal product of labor (MPL).

If the marginal product of labor is obtained by differentiating the production function of Kobe - Douglas, where the marginal productivity of the factor is proportional to its average productivity, it can be explained why in countries with high average labor productivity there are high and real wages. Conversely, in countries where labor productivity is low, real wages are also low.

As for the analysis of state intervention in the formation of the labor market, setting the minimum wage usually upsets the balance and increases unemployment. Therefore, there

is a need to study and summarize the experience of foreign countries in regulating wages,while the method of calculating the minimum wage needs to be improved.

GDP and wages

Today, the development of Ukraine's economy, which takes place in conditions when labor and wages continue to occupy a place that is not adequate to their role and importance in the functioning of a market economy, depends on certain factors. First of all, it is an opportunity for economic growth in the country, as the economy is the foundation of social development, and its strength is a guarantee of social welfare, especially the growth of income and wages.

In economic research in recent years, in accordance with the concept of sustainable development, much attention is paid not only to the conservation of natural resources, but also labor. Among the number of scientists from Poland and Ukraine who study this issue are such as V. Sarioglo (2015), G. Tereshchenko (2015), BleiereDaina (1992), J. Polcyn (2018), M. Gawrysiak (2018), G. Przekota (2018), S. Korablin (2015), J. Rembaza (2018), A. Yakymchuk (2020). Thus, the first set of factors that significantly affect the process of wage formation includes GDP growth rates and its distribution on consumption and accumulation; dynamics of separate branches of domestic production and proportionality in their development; achievements in the development of small business; rates of change in labor productivity; population dynamics; increase or decrease of employment opportunities for the able-bodied population of the country and the dynamics of unemployment; opportunities for the formation of domestic investment resources; the degree of stability of the domestic currency and the strength of the financial system in general, the presence and size of external debt and the degree of dependence of the economy on foreign capital; dynamics of prices, in particular the dynamics of housing and communal and transport tariffs and the degree of their compliance with the real size of wages and per capita income; the presence of arrears in payments [Taxation in Poland, 2020].

Throughout its independence, Ukraine has seen the following trends depending on changes in wages in all spheres of economic activity and changes in real GDP: in the period from 1990 to 2019, GDP fell by more than three times (Table 1), with a long period

(from 1995 to 2002) when the number of goods and services produced in the country for a year was half of that from before Ukraine's independence [Yakymchuk A., 2021].

Table 1. The growth rate of real GDP and income

Years	GDP, billion US dollars	GNI per capita (USD)	Real GDP (% to previous year)	The amount of real wages (% to the previous year)
1991	77,465	1520	91,3	
1992	73,942	1420	90,1	
1993	65,649	1230	85,8	
1994	52,55	1000	77,1	
1995	48,214	920	87,8	110,6
1996	44,558	860	90	96,6
1997	50,15	890	97	96,6
1998	41,883	850	98,1	96,2
1999	31,581	760	99,8	91,1
2000	31,262	700	105,9	99,1
2001	37,972	730	109,2	119,3
2002	42,352	790	105,2	118,2
2003	50,084	980	109,6	115,2
2004	64,82	1270	112,1	123,8
2005	86,058	1540	102,7	123,3
2006	107,648	1950	107,1	118,3
2007	142,58	2590	107,3	112,5
2008	179,817	3210	102,8	106,3
2009	117,113	2840	85,5	90,8
2010	136,01	2980	104,1	110,2
2011	163,16	3110	105,4	108,7
2012	175,781	3500	100,2	114,4
2013	183,31	3800	100	108,2
2014	133,503	3560	93,4	93,5
2015	91,031	2700	90,2	79,8
2016	93,356	2370	102,4	109
2017	112,19	2380	102,5	119,1
2018	130,902	2800	103,4	112,5
2019	153,781	3370	103,2	106,5

Source: Official site of the world bank, Official site of the state statistics service of Ukraine.

Of course, one cannot ignore the fact that throughout the period of its independence, Ukraine has been constantly "experiencing" crises, like the crisis of 1990 – (first half), the crisis

of 2008-2009, as well as 2014-2015. 2020 became a year of trial for the entire world economy, and, of course, for Ukraine's economy. Which is clearly traced at the level of income, and. Unfortunately. increasingly leads to impoverishment of the population of Ukraine.

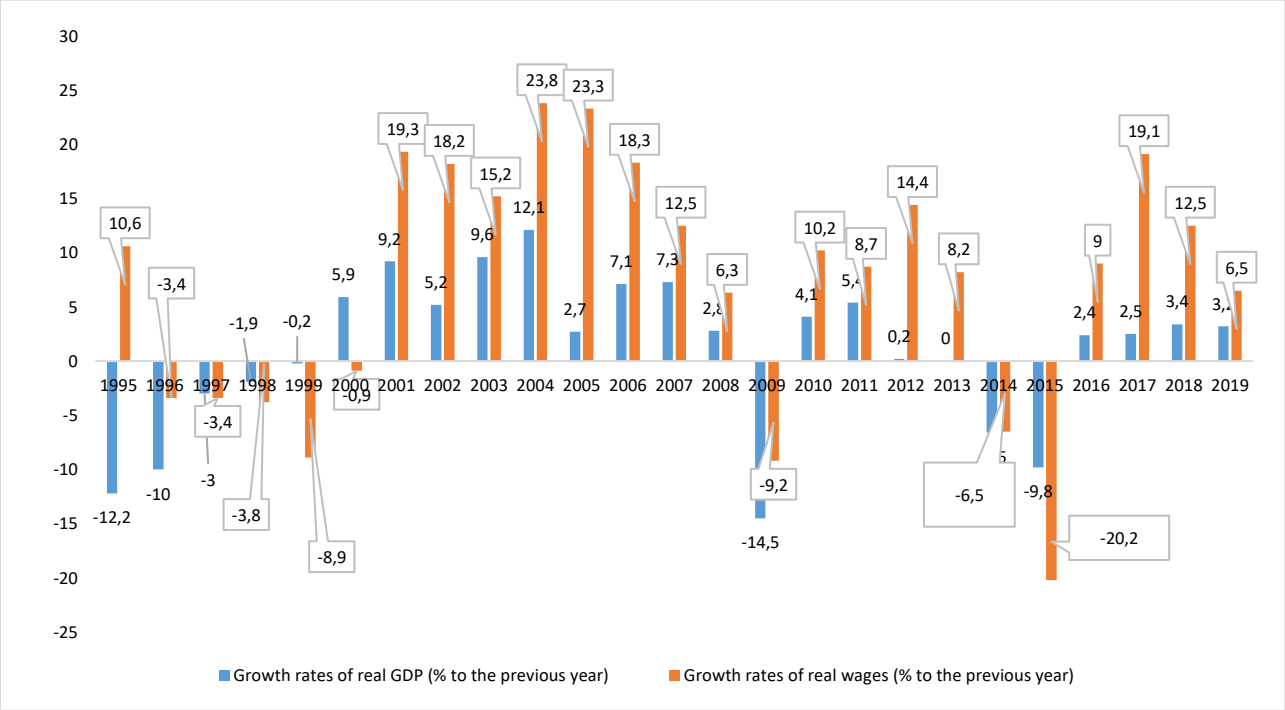
Only in 2003, Ukraine reached the level of production that corresponded to 1994 (54.4% of GDP compared to 1990). In 2007, the level of production slightly exceeded the level of 1993. In 2008, we managed to reach production volumes that amounted to 77% of the 1990 level. However, in 2009, the value of real GDP decreased to 63% of the 1990 level and actually returned to the 2005 level.

In addition, according to the World Bank, there has been a decline in real GDP of Ukraine - the largest of the 166 countries that disclosed full statistics for 1991-2014, it decreased in only four other countries: Moldova (-29%), Georgia (-15, 4%), Zimbabwe (-2.3%), the Central African Republic (-0.94%). In Ukraine, this figure was -35% [Korablin, 2015].

As for GNI per capita, in 2019, Ukraine was in 70th place (from the end) among all countries whose data are analyzed by the World Bank, and much lower than in any other European country. Thus, the average GDP per capita in Europe in 2019 amounted to USD 35,812 thousand , Europe and Central Asia – USD 25,205, and in Europe and Central Asia, except for high-income countries – USD 8,036. In Ukraine, this figure was only USD 3,370. At the same time, for example in neighboring Poland – USD 15,350, and in the Russian Federation – USD 11,260 [Official site of the world bank, 2020].

If we compare with the other 4 countries, which also saw a decline in real GDP, then two of them, namely Georgia and Moldova, had a GDP per capita in 2019 of 41.8% and 36.2% more than in Ukraine, respectively – USD 4,780, and USD 4,590 [Official site of the world bank [2021]. The GDP growth rate in comparison with the previous year also decreased for a long time and only in 2000 exceeded the mark of 100% by 5.9 for the first time (Fig. 1).

Fig.1. Dynamics of real GDP and wage growth rates in 1991-2019



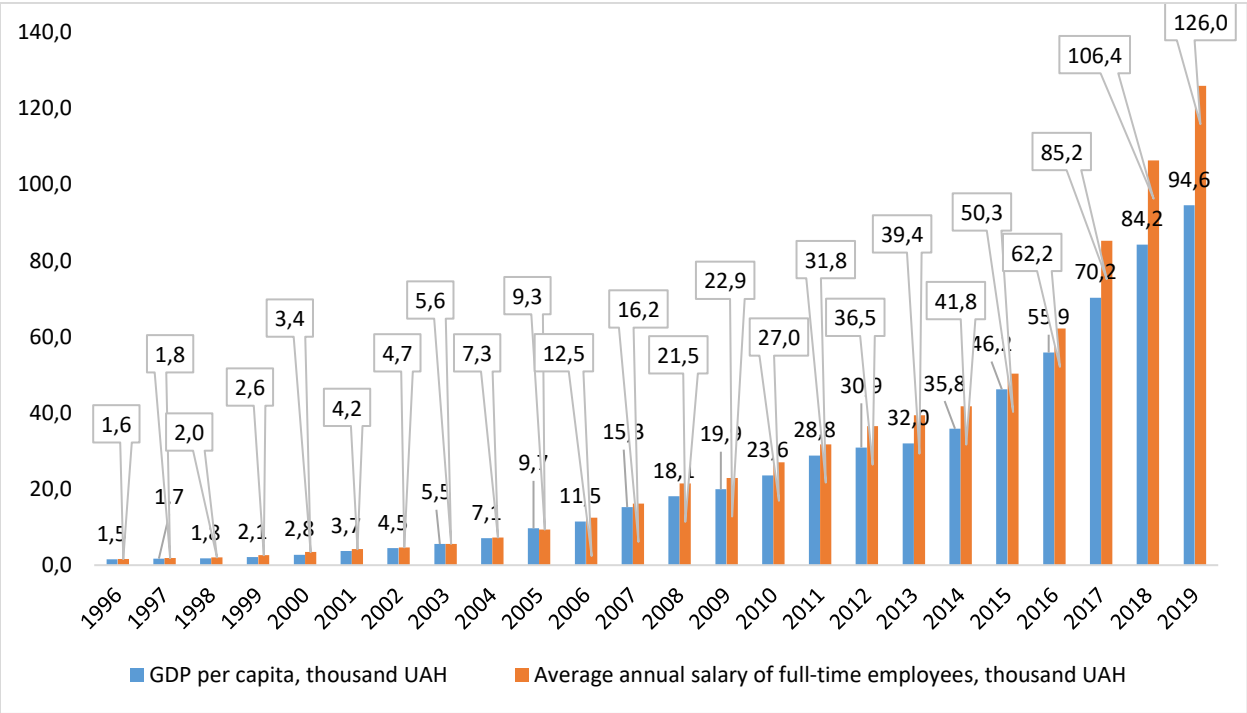
Source: authors' calculations according to the data: official site of the state statistics service of Ukraine.

This dynamics corresponds to the growth rate of real wages as a percentage of the previous year. Thus, in the period from 1996 to 2000, it was constantly declining. In 1999, the decrease was 8.9%, and was the highest for that period. Since 2000, there has been a marked increase in real wages, by an average of 20% per year. However, even under such conditions, the real income of the population until 2004 remained less than half of that in 1991. Unfortunately, since 2006, the growth rate of real wages has been declining again. Thus, in 2008, the value of real wages was only 6.3% higher than the previous year. But in 2009, there was the largest reduction in GDP (by 14.5%) compared to the previous year, while the reduction in real wages was 9.2% [Polishchuk, 2014]. Already in 2014-2015, the reduction was 6.6% and 9.9%, respectively, while real wages decreased by as much as 6.5% and 20.2%, respectively. And although after the crisis of 2014-2015 there was a positive trend, still in 2019 the growth of real wages was only 6.5%, with real GDP growth of only 3.2% [Yakymchuk A., 2017; Ivanova, 2019].

As for the ratio of wages and GDP per capita, if before 1999 this figure was constantly declining, so the annual average wage per employee was 95% of GDP per capita in 1996, in 1999 – 80%, then in the year 2005, for the first time, the value of the annual average nominal wage was 103.6% higher than the value of GDP per capita. This trend continued in

2019, with an annual average salary of UAH 125,964 (USD 4,882), the value of GDP per capita was 25% lower and amounted to UAH 94,589 (USD 3,666) (Fig. 2).

Figure 2. Dynamics of growth of average annual wages and GDP per capita



Source: Ministry of finance. 2020, Official site of the state statistics service of Ukraine.

Thus, in 2018, GDP by category of end use was 3.3% lower than in 2010. The number of employees for 9 years decreased by 23.6% and in 2019 amounted to 16,578 thousand people. This is despite the fact that, for example, in 2010 there were 19,180 thousand people employed, in 2000 – 20,175 thousand people, and in 1990 – 23,301 thousand people. Thus, during the years of independence, the number of employed people in Ukraine decreased by 40% – which amounted to 6,723 thousand people. In addition, despite the fact that the minimum wage in our country regularly increased in 2010, it was still more than one and a half times lower than in 1990, and in 2019, after a significant drop in 2014-2015, only returned to the level from 2010 (Table 2).

Table 2. Dynamics of the main macroeconomic indicators of economic development of Ukraine for 2010-2019 (base of 2010) (%)

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Indices of physical volume of GDP by categories of end use (at constant 2010 prices), %									
100	105.5	105.7	105.7	98.8	89.1	91.3	93.5	96.7	x
Number of employees (in % before 2010)									
100	100.3	100.4	100.7	94.2	85.7	84.9	84.2	85.3	86.4
Real wage indices (in % by 2010)									
100	99.0	100.5	96.7	78.3	81.5	96.4	107.6	99.3	100.8
Labor productivity by GDP (in % by 2010)									
100	120.1	129.6	134.8	156.0	214.9	260.4	328.2	386.8	426.1
The share of wages in cash income (in % by 2010)									
100	102.73	106.72	106.30	102.52	99.16	98.11	110.08	114.50	120.38

Source: authors' calculations according to the data: Ministryoffinance (2021), Official site of the state statistics service of Ukraine, State statistics service of Ukraine (2020).

The analysis shows that there is a direct relationship between GDP growth and wages. To follow it, we used data for the last 24 years (1996-2019) [Official site of the state statistics service of Ukraine], on the basis of which we built an econometric model, according to which, with the growth of production of goods and services by 1%, the average nominal wage increased by 0.2 % (ZP = 0.002 GDP – 96.47, R = 0.99, a_0 = 0, b_0 = 22.65).

We also examined the relationship between wages and productivity in Ukraine over the past 24 years. The study showed that with a 1% increase in labor productivity, wages more than quadrupled. ($3P$ = 469.0 * PP-61.36, R = 0.99, a_0 = 12.72, b_0 = 21.66).

Ukraine's relations with individual countries of the world

In general, over the last decade, in Ukraine, according to official statistics, there has been an increase in production, and relatively positive dynamics of wages, but this does not indicate positive trends in the effectiveness of labor motivation.

This is confirmed primarily by the fact that the actual indicators of labor productivity in Ukraine are quite unfavorable from similar indicators of market economies. Proof of this can be a comparison at the macro level – indicators of gross value added per employee, at the enterprise level – the productivity of the employee. Comparison of these indicators with the level of wages indicates a low standard of living, and hence the possibility of maintaining social tension in society.

The degree of such validity can be assessed using international comparisons, for example, Ukraine's relations with other Central and Eastern European countries in terms of labor productivity (GDP per capita) and average wages. If both ratios are approximately the same, it can be concluded that the level of wages in Ukraine is objective and economically justified. If the ratio is higher in terms of labor productivity, the salary is understated, if lower – too high [Polishchuk, 2012].

The results of calculations performed according to comparative data show that Ukraine's lag in the level of labor productivity roughly corresponds to the wage lag. At the same time, the trends reflect the outpacing growth rates of wages in Ukraine, rather than labor productivity. In addition, if in developed countries the ratio of GDP per capita to average monthly wages is kept at about the same level with an upward trend, in Ukraine there is a gradual decline, with a sharp decline in 2017 to 8.2 from 14.9 in 2010, which certainly leads to increasing the impoverishment of the population of Ukraine (Table 3).

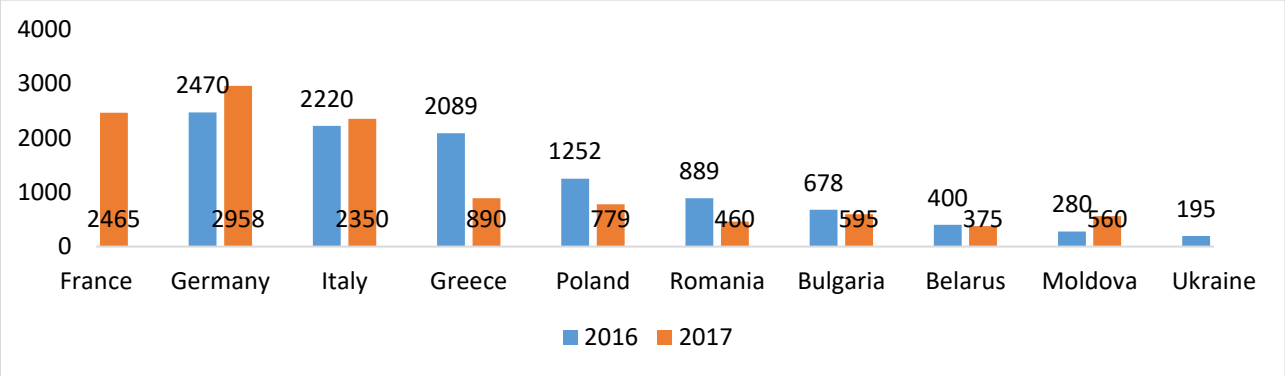
Table. 3. The ratio of Ukraine with some countries in the world for 2000-2017

Year	Ukraine	USA	Poland	Germany
GDP per capita, USD				
2000	632	36,450	4,459	23,719
2005	1,825	44,307	7,980	34,697
2010	2,553	48,373	12,507	41,786
2015	2,125	56,207	12,475	41,177
2016	2,185	57,467	12,332	41,936
2017	2,194	59,501	13,429	44,550
Average monthly salary, USD				
2000	42.3	3247	509.3	2,154.3
2005	157.3	3,780.3	812	3,159
2010	283.5	4,365.4	1,124	3,620
2015	192	4,915.1	1,009.1	3,476
2016	202.8	4,973.4	1,008.1	3,541
2017	267.1	5,046.5	1,122.5	3,713.6
The ratio of GDP per capita to average monthly wages				
2000	14.9	11.2	8.8	11.0
2005	11.6	11.7	9.8	11.0
2010	9.0	11.1	11.1	11.5
2015	11.1	11.4	12.4	11.8
2016	10.8	11.6	12.2	11.8
2017	8.2	11.8	12.0	12.0

Source: authors' calculations according to the data: official site of the state statistics service of Ukraine, State statistics service of Ukraine, 2020.

Despite the constant increase in wages in Ukraine, even before the global economic crisis, not only did this gap not decrease, but in most cases it increased. So if in 2005, in comparison with the Czech Republic, the lag was 73 euros, then in 2008 the gap increased to 264 euros, in comparison with Poland, the lag in 2008 made 269 euros (in 2005 61 euros), with Estonia – 213 euros (in 2005 – 53 euros), with Bulgaria – 47 euros (in 2005 – 44 euros). Already in 2017, the salaries of Ukrainians were 11.5 times lower than those of the French, 13.9 times lower than those of the Germans, and 2.6 times lower than those of Moldovans (one of the five countries where real GDP fell) (Fig. 3).

Figure 3. Average monthly salary of Ukraine and European countries for 2016-2017, euro



Source: authors' calculations according to the data: official site of the European statistics service

Economic emigration

In Ukraine, Labor migration remains an important issue in the form of a net outflow of workers as a factor in replacing labor with capital. After all, the duration and scale of labor migration depend on how wages and living conditions in Ukraine differ from potential countries for employment. The reality today is that, given the demographic changes and aging populations of many countries, including the old EU member states, there will be an increasing shortage of workers, so the openness of EU countries to the labor of migrants from Ukraine may increase. On the other hand, the wage gap between Ukraine and European countries, even with unofficial wages, will remain an incentive for migration for many years to come.

Note that the migration of 2-3 million people has contributed to the reduction of the labor force in Ukraine, causing a shortage of labor in certain professions. This can be seen as one of the factors (not necessarily) that contributes to the growth of wages of workers who remain in the country.

As for highly educated workers among emigrants, their share is not high (16% of migrants had higher education according to the SSSU survey in 2017, against 32% of those employed in Ukraine according to the SSSU labor force survey in 2020). Therefore, the problem of «brain drain» and the impact on productivity should not be exaggerated.

In general, labor migration is an important factor for Ukraine in the coming years. And while its effects have so far been largely beneficial to migrants (increased remittances, and the living standards of migrant families), this may change in the long run if emigration begins to harm price competitiveness, the investment climate, and public finances.

Assessment of the welfare of the population

Assessing the impact of key macroeconomic factors on wage formation in Ukraine, special attention should also be paid to assessing the level of welfare of the population. It is known that the level of welfare characterizes the number of goods and services that an employee can receive for their wages and depends on three main factors: the size of nominal wages, consumer price index for goods and services, the amount of deductions from nominal wages. Note that despite the rapid growth of nominal wages throughout the study period, the purchasing power of the population fell just as rapidly. The conditional calculation indicator, which is intended for an objective assessment of the purchasing power of the population is the level of real wages. Although in the analyzed period the nominal wage was constantly growing, and the real wage in 1995 was 30.3% of the real wage in 1990, and continued to decline until in 1999, it reached the lowest level of 26.1 % in 1990. In 2000, there was a tendency for a slight increase (28.4%), in 2004 the purchasing power of the population in terms of real wages was three times lower than in 1990 and amounted to 34% of 1990 [Polishchuk, 2012; Yakymchuk, 2020; Sarioglo, 2015].

The main reason for this state of affairs was that the growth rate of prices for consumer goods and services in 1995-2009 was 2.7 times higher than the growth rate of real wages. As for the last decade, the growth rate of nominal wages almost corresponded to the consumer price index. The largest increase was in the group «Housing, water, electricity, gas and other fuels» – 6.13 times compared to 2010, significantly increased the cost of educational services – 2.8 times, and almost as much increased the cost of health care, 1-2.6 times. On the

other hand, the growth rate of prices for clothing and footwear was even lower than the growth rate of real wages – 1.4 and 1.6 times, respectively (Table 5).

Table 5 Consumer price indices and growth rates of nominal and real wages in 2010-2019

Years	Consumer price index	Food and soft drinks	Clothes and shoes	Housing, water, electricity, gas and other fuels	Health care	Recre-ation and culture	Edu-cation	Nomi-nal wage growth	Real wage growth rates
2010	100	100	100	100	100	100	100	100	100
2011	104.6	101.7	101	111	106.4	103.2	105.7	116.2	111
2012	104.3	99.4	98.7	111.8	108.5	103.5	110.3	126.8	122.1
2013	104.9	98.7	95.3	112.1	111.8	103.1	112.7	134	128.8
2014[1]	130.9	123.2	109.1	150.6	145.3	128.7	118	144.4	115.2
2015[2]	187.7	174.3	147.3	305.7	187.6	177.5	146.6	174.8	105.3
2016[2]	210.9	180	155.3	450	202.1	185.5	166.6	198.6	116.9
2017[2]	239.7	211.9	156.8	497.6	217.3	193.8	191.5	234.1	135.8
2018[2]	263.1	228.4	159.9	550.6	236.8	202.3	217.3	254.6	1455
2019[2]	273.8	239.3	156.2	540	245.7	202.1	246.6	270.6	1568
2020[2]	287.5	251.1	144.8	613.2	264.7	2022	2809	278.1	1613

[1]The data are given without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol.

[2] Data are given without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Luhansk regions.

Source: authors' calculations according to the data: official site of the state statistics service of Ukraine.

Of course, we can identify factors that at one time (before the global financial and economic crisis) hindered the development of inflation, for example: the implementation of a set of anti-inflationary measures of the Government and the NBU (the budget did not create preconditions for excess demand), or the fall of world oil prices. However, there are many more accelerating factors: firstly, a significant lag impact from the increase in industrial producer prices (in particular, food products), formed in previous periods (due to rising energy and agricultural costs, increased labor costs, loan servicing) and investment costs); secondly – lag influence from growth of money supply in economy (money supply has increased); and finally, of course, the convergence factor (the formation of which is influenced

by the openness of Ukraine's economy, increasing the inflow of imported goods; inflationary processes in most countries) [Polishchuk, 2012; Polcyn J., 2018].

In general, it can be argued that during the analyzed period (1991-2019), with each increase in nominal wages by 1%, inflation increased by 2.2%, and the result was a sharp impoverishment of a large mass of the population.

From here, we draw the conclusion about the absence of a corresponding economic basis. Since the growth of real wages implies an increase in nominal wages (and it was still limited during the crisis of the 1990s), it was also necessary to take measures of state policy aimed at limited inflation. For a long time now, the main condition for raising wages has been the achievement of stable economic growth. However, the low purchasing power of the population blocks production, restricts the movement of domestic goods, and does not allow the domestic consumer to become a strategic engine for the growth of national production [Ivanova A., 2019; Sarioglo V., 2015].

In order to more clearly determine the impact of the inflation index on wages, we trace what changes occurred with wages denominated in foreign currency (Table 6).

Thus, it can be seen that the value of the real wage of the population also depends on the exchange rate dynamics of the hryvnia. After all, even with the minimum inflation rate – 2-3 percent per year – the exchange rate strengthening of the national currency will constantly worsen the competitive position of domestic producers in both foreign and domestic markets. To one degree or another, it affects not only the main domestic exporters – metallurgists and chemists, but also workers in light and food industries, forestry and woodworking, agro-industrial complex and farmers, public sector workers, retirees, students and more.

Such negative effects can be avoided by forming the same rates of exchange and price dynamics. In this case, goods compete more for quality and cost than for exchange rate advantages, which may have a very distant relation to the efficiency of their production [Polishchuk, 2012; Korablin S., 2015].

Table 6. Dynamics of average monthly and minimum wages in national and foreign currency

Year	Average monthly salary, UAH	Average monthly salary, USD USA*	Minimum wage, UAH	Minimum wage, USD USA*
1996	126	68.9	15	8.2
1997	143	76.8	45	24.2
1998	153	62.5	50	20.4
1999	178	43.1	74	17.9
2000	230	42.3	80	14.7
2001	311	57.9	118	22
2002	376	70.6	150	28.2
2003	462	86.6	190	35.6
2004	590	110.9	220	41.4
2005	806	157.3	300	58.5
2006	1,041	206.1	400	79.2
2007	1,351	267.5	460	91.1
2008	1,806	225.75	532.5	66.6
2009	1,906	238.25	643.5	80.4
2010	2,239.0	281.3	894.0	112.3
2011	2,633.0	329.9	972.5	121.9
2012	3,026.0	378.7	1,104.2	138.2
2013	3,774.0	459.7	1,182.5	144.0
2014	3,988.0	253.0	1,218.0	77.3
2015	4,789.0	303.7	1,298.0	82.3
2016	5,902.0	235.7	1,476.0	58.9
2017	7,631.0	295.8	3,200.0	124.0
2018	9,633.0	348.4	3,723.0	134.6
2019	11,788.0	467.8	4,173.0	165.6
2020	11,201.7	395.8	4,753.8	168.0
Wage growth, in nominal terms *	88.9	5.7	316.9	20.5

Source: Ministry of finance, 2021, Official site of the state statistics service of Ukraine.

In general, not only the above factors influenced the formation of wages in the context of market transformation of Ukraine. After all, over the years of reforms, the labor market itself has suffered significantly. Of course, today we can say it is somewhat stable, but during the economic downturn, the labor market underwent significant distortions, which are still felt today.

Conclusions

Wage formation in Ukraine took place in conditions when labor occupied a place inadequate to its role and importance in a market economy. This was the reason for its low level. Despite the fact that nominal wages have been growing steadily, today the level of real wages still remains low. There are a number of factors that significantly affect the wage formation process. Such factors include GDP growth; dynamics of separate branches of domestic production; rates of change in labor productivity; population dynamics; employment opportunities; unemployment dynamics; the degree of stability of the domestic currency and the strength of the financial system in general; the dynamics of prices and the degree of their compliance with the real size of wages and per capita income; the presence of arrears in payments.

The structure of monetary income of the population has also undergone significant changes during the years of Ukraine's independence, which has led to its significant stratification. In addition to the decrease in the share of wages in income, inter-sectoral, inter-regional, inter-qualification (inter-job) ratios in wage levels have been and remain unsatisfactory. In addition, significant wage arrears remain. The worst thing is that low wages have caused poverty to spread among the working population.

We should also not ignore the fact that today, Ukraine has temporarily occupied territories, and war and destruction continue in the largest industrial region. Under such conditions, and such dynamics of the main macroeconomic indicators, Ukraine will be on the sidelines of the world economy for a long time, far from its neighbors, not being able to share their successes, plans or capabilities.

In general, the article conducts a systematic study of the theoretical and methodological foundations of wage formation in the economic system of Ukraine, which allowed to obtain theoretical and practical results, characterized by scientific novelty. In particular, the influence of the main macroeconomic indicators on the level of wages using correlation - regression analysis is estimated. It is revealed that in the conditions of market changes in the economy of Ukraine, the connection between the growth rates of real wages and labor productivity is insufficient, which indicates the absence of an effective organizational and economic mechanism of wage formation.

Prospects for further research. In the course of the analysis, we were able to investigate the impact of key macroeconomic factors on wage formation in Ukraine throughout the period of independence. This makes it possible to form a set of measures that, in our opinion, should affect the level of real wages of Ukrainians, and hence the level of welfare of the nation, will allow to form a middle class in the country and reduce poverty. A level of well-being of the population of Ukraine that will give the opportunity to reach a new, European, standard of living.

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Corporate Social Responsibility's impact on the development of small and medium-sized businesses in the region: The study of the food sector of the Lviv region in Ukraine

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Abstract: The "corporate social responsibility" (CSR) phenomenon indicates that this practice applies to large enterprises. However, the competition in markets does not know the rules. In this case, the question of the need for CSR for SMEs arises. SMEs have difficulties with CSR activities' implementation due to limited financial and human resources. Therefore, for the study, we have chosen SMEs and their CSR experience. The purpose of the work is to find out the most important factors that influence the CSR perception of SMEs among food service enterprises in the Lviv region of Ukraine. The respondents' attitude towards activities in three main CSR pillars (ecological, economic and social areas) is researched. Representatives of executive positions of companies were the respondents within the study. A quantitative approach using questionnaires was adapted to the survey, using a sample of 107 representatives of SMEs in the foodservice sector. There was performed a statistical analysis by using IBM SPSS software and MS Excel. Regression analysis, Correlation analysis, and ANOVA were used to process and evaluate the received data. We can conclude that the research describes the main factors that motivate a company to carry out CSR activities. In addition, we have analyzed the main measures in the three pillars of CSR. The study is focused on the food service business. The document also concentrates on the work of small and medium enterprises in the context of the three main areas of CSR. This study can give impetus to new research among SMEs and their performance in the CSR direction.

Key words: Corporate Social Responsibility; Foodservice Industry; Ukraine

JEL: C12, O12, R11

Introduction

Changing the environment of the functioning of enterprises requires the implementation of new management concepts. Implementation of CSR practices in business is an extremely urgent task, which is caused by the development of conceptual

provisions for doing business, increasing requirements from consumers to the activities of enterprises and their impact on society and the environment [Kolot, 2013; Grischuk, 2012].

We can consider that Corporate Social Responsibility, in the most general, "grounded" interpretation, is a rational response of an organization to the conflicting expectations of interested parties (stakeholders) aimed at sustainable development of the company. Corporate Social Responsibility is a type of social commitment (mostly voluntary) implemented by corporate governance for employees, partners, civil institutes and society. This concept directs the company to develop within three main pillars: economic, social and environmental [Ubrežiová, 2005; Skarmeas, 2013; Perera, 2013].

Besides, it should be noted that the development of Ukrainian business, integration into the world economic system poses new challenges for domestic enterprises, which are related to the intensification of processes in the field of social responsibility. Moreover, the state of the natural environment and the quality of consumer goods largely depend on the activity of enterprises. The social orientation of business will be more effective and have a systemic character if their social responsibility of is included in the strategy of enterprise management [Kolyanko, 2016; Mccullough, 2016].

Today, all the major national companies, banks, and corporations are trying to integrate the concept of corporate social responsibility into their business activities. However, it also has a significant impact on SMEs. Modern business, and especially SMEs, often lack a comprehensible explanation of the fact that CSR is not something special, caused by modern circumstances, but a norm arising from the nature of the business [Sokil, Ubrežiová, 2018; Ubrežiová, Horská, 2016].

Practice shows that the implementation of CSR practices is rapidly developing only in large companies or SMEs whose activities are focusing on IT or other high-tech sectors of the economy. Moreover, it should be noted that the scientific literature does not sufficiently explain the problems faced by SMEs during the implementation of CSR in their activities [Kasych, 2014; Kravchenko, 2013].

Thus, the aim of the study is to find out the most important factors that have an influence on the CSR perception. Moreover, it is necessary to find the factors that motivate and hinder CSR's implementation in the activities of companies. The foodservice SMEs in the Lviv region of Ukraine have become the target audience for the study.

The choice of this business sector can be explained by the fact that on the one hand, the food sector in Ukraine is developing rapidly, and on the other, there is a lack of quality research in this area of business.

Furthermore, two hypotheses and three research questions were formed. The following section describes the literature review describing CSR's development in Ukraine. The third section of the article represents the hypotheses and research questions. Materials and methods are included in the fourth section. The results of the research are represented in the fifth section. The discussion of the work is described in the sixth section. The last part of the article includes conclusion, limitations and suggestions for further research.

Theoretical premises

The social responsibility of domestic enterprises consists of the full payment of taxes, observance of the work legislation and environmental protection. Moreover, CSR activities could be express in the creation of workplaces or in charitable actions. All these measures are aimed at the external environment of the enterprise. Besides, increasing productivity, improving competitiveness, optimizing cost, implementing a strategy for further development, improving image, increasing turnover or the number of consumers is attributed to the CSR initiatives aimed at the internal environment. It is necessary to notice that the participation of small businesses in social activities is usually informal. This phenomenon is due to the lack of management skills in the field of CSR implementation of small and medium enterprises' managers [Zhmay, 2015].

Practice shows that small and medium-sized enterprises have better links with the local social and cultural environment. Based on this fact, it can be argued that SMEs are more aware of local risks than TNCs [John et al., 2011; Ding at al., 2019].

Kravchenko described one of the main tasks that needs to be explained to Ukrainian small and medium business is that Corporate Social Responsibility is a concept that has nothing in common with additional financial or other costs and coercive measures. One of the reasons for the importance of Corporate Social Responsibility is that SMEs have the opportunity to determine a successful business strategy. CSR helps to work for the future and to achieve sustainable development of enterprises [Kravchenko, 2013].

Thus, we can confirm that scientists today are describing the development of CSR in the activities of SMEs. However, we can say that there are still some gaps in research in this area. In particular, there are no clear formulations of what factors influence the formation of the strategy for CSR implementation and development. Based on these data, our study focuses on finding the main factors that motivate SMEs in the Lviv region to use CSR in their activities.

Scientific literature shows that, regardless of the country, small and medium enterprises still do not fully understand the value of implementing CSR methods into their activities. However, the previous study explains that companies with good financial situations are more implemented in performing CSR activities at a high level [Ding at al., 2019; Fauzi & Idris, 2009]. Thus, the following hypothesis is suggested:

Hypothesis 1: CSR is pursued when the company's financial situation allows it.

Besides, the authors claim that enterprises are focused on the type of CSR activity that is regulated by the legislation of the country [Okhrimenko & Ivanova, 2015; Sardak & Shmyhovska, 2017]. Previous studies suggest that those activities within CSR economic pillar are the most common for companies. The authors explain this situation by law-controlled measures within this pillar. Thus, such kind of activities is undertaken by businesses to avoid violations of the law [Kolk & Van Tulder, 2010; Lusch & Vargo, 2014; Perera & Chaminda, 2013]. Therefore, the following hypothesis is suggested:

Hypothesis 2: Companies prefer to implement CSR measures that are regulated by state law.

Three research questions were formed:

- RQ 1. What kind of CSR measures are implemented by the surveyed enterprises within the economic pillar?
- RQ 2. What kind of CSR measures are implemented by the surveyed enterprises within the social pillar?
- RQ 3. What kind of CSR measures are implemented by the surveyed enterprises within the environmental pillar?

Methodology

The research was conducted among the companies of the Ukrainian food sector operating in Lviv. The questionnaire method was chosen as the main source of information

in our research, since the answers that we received after the survey are the main source of the primary data of our study. The principal advantages of the questionnaire method are its efficiency and relatively low implementation costs. Representatives of executive positions of companies were the respondents within the study.

The main goal of the survey is to identify the main barriers and factors that decrease motivation for CSR activities' implementation by small and medium-sized enterprises that are operating in the foodservice sector of the selected country. This method will also help us to clarify which of the CSR pillars is the most developed in Ukraine. The questionnaire includes the question of assessing the level of CSR awareness by owners, directors or the main managers of companies that participated in the survey. The questionnaire consists of 7 parts and includes closed-, semi-closed- and open-ended questions:

- I part - General information about the company;
- II part - Implementation and management of CSR in the company's activities;
- III part - Ecological pillar;
- IV part - Economic pillar;
- V part - Social pillar, which includes: V.I Workplace policy and V.II Policy towards community.

During the creation of the questionnaire, we used Likert scale. According to it, the respondent evaluates the degree of their agreement or disagreement with a judgment. With the help of the Likert scale, we are able to assess the level of a company's leader awareness about the CSR concept. In this case, 1 - "strongly disagree," 5 - " strongly agree." In addition, with the help of Likert scale, we can evaluate how much the company is dealing with activities in the context of economic, environmental and social spheres. In our case, the number 1 corresponds to the answer "not dealing ", and 5 - "dealing a lot". Likert scale is also used in questions where the respondents assess the regularity of conducting the CSR activities. In this case, 1 - "strongly disagree", 5 - "strongly agree". Besides, the questionnaire includes closed, semi-closed and open forms. The answers to those questions give the opportunities to explore respondents' attitudes toward CSR within research questions.

Results

We received 107 responses from representatives of the executive position of Ukrainian companies that are operating in the foodservice industry. The questionary was conducted between November 2019 - March 2020. The survey involved 44 medium-sized and 63 small companies. Most of the respondents have existed in the market for 5 to 10 years, 29 companies have been operating for 1 to 5 years, 23 companies - more than 10 years and 6 enterprises - less than a year. The majority (77.6%) has a domestic owner. It is also worth noting that 40.2% of the surveyed units have shown good financial standing over the last three years.

The IBM SPSS Statistics V.20 was used for statistical processing of the obtained data. Furthermore, Regression analysis and Correlation analysis were implemented. Block DR_CSR provides information about the factors that motivate or do not motivate a company to implement CSR activities. The answers of the respondents were recoded into values, so in our case, value 2 represents the answer "yes", and value 1 - "no". Table 1 shows the companies' responses.

Table 1. Drivers of CSR implementation: average scores (company's existence)

The company's existence	DR_CSR_1	DR_CSR_2	DR_CSR_3	DR_CSR_4	DR_CSR_5	DR_CSR_6	DR_CSR_7	DR_CSR_8	DR_CSR_9
Less than 1 year	1.74	1.90	1.71	1.90	1.97	1.97	1.77	1.16	1.94
1-5 years	1.89	1.91	1.64	1.80	1.96	1.94	1.69	1.15	1.96
5-10 years	1.82	1.93	1.56	1.82	1.96	1.96	1.62	1.13	1.94
More than 10 years	1.85	1.89	1.66	1.87	1.96	1.92	1.57	1.15	1.92
Total	1.84	1.91	1.61	1.83	1.96	1.95	1.65	1.14	1.94
Deviation from the mean, %									
Less than 1 year	-5.10	-0.51	6.00	4.06	0.33	0.83	7.84	1.69	-0.33
1-5 years	3.19	-0.37	1.39	-1.59	0.17	-0.53	2.98	0.96	1.17
5-10 years	-1.08	0.85	-3.26	-0.73	-0.20	0.66	-1.71	-1.25	-0.30
More than 10 years	0.74	-1.36	2.94	2.13	0.05	-1.39	-4.81	0.79	-0.90

Source: own research, 2020

Note: DR_CSR_1 - Moral-ethical reasons;

DR_CSR_2 - The improving of economic indicators;

DR_CSR_3 - Better relationships with investors;
DR_CSR_4 - Better relationships with community;
DR_CSR_5 - Maintaining/increasingthe company´s reputation;
DR_CSR_6 - Increasing employee motivation;
DR_CSR_7 - The desire for environmental protection;
DR_CSR_8 - Third party pressure (buyers, competitors, suppliers, etc.);
DR_CSR_9 - Increasing/maintaining the level of customers' loyalty.

Table 1 shows the respondents' answers depending on the duration of their existence on the market. The calculations show that, despite the length of existence, all respondents agree that improving economic indicators, maintaining/increasing the company´s reputation, increasing employee motivation and increasing/maintaining the level of customers' loyalty are the factors that motivate firms to develop CSR activities. At the same time, third party pressure does not motivate firms to perform such kind of activities.

Table 2. Drivers of CSR implementation: average scores (division by ownership structure)

Ownership structure	DR_CSR_1	DR_CSR_2	DR_CSR_3	DR_CSR_4	DR_CSR_5	DR_CSR_6	DR_CSR_7	DR_CSR_8	DR_CSR_9
Domestic owner	1.81	1.90	1.56	1.80	1.95	1.94	1.59	1.11	1.94
Foreign owner	1.93	1.93	1.79	1.93	2.00	2.00	1.79	1.50	2.00
Domestic owner with foreign investor	2.00	2.00	1.94	1.97	2.00	2.00	1.97	1.21	1.91
Subsidiary of MNE	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Total	1.84	1.91	1.61	1.83	1.96	1.95	1.65	1.14	1.94
Deviation from the mean, %									
Domestic owner	-1.47	-0.65	-3.32	-1.34	-0.37	-0.47	-3.12	-2.70	0.03
Foreign owner	5.07	0.82	10.71	5.44	1.97	2.48	8.54	31.36	2.99
Domestic owner with foreign investor	8.96	4.55	20.35	7.74	1.97	2.48	19.78	5.60	-1.55
Subsidiary of MNE	8.96	4.55	24.00	9.35	1.97	2.48	21.57	75.14	2.99

Source: own research, 2020

When looking at Table 2, it can be seen that the responses of enterprises with a foreign owner, domestic owner with a foreign investor and subsidiary of MNE show the largest deviation from the mean. In particular, half of the companies with a foreign owner and all subsidiaries of MNE have stated that the pressure from third parties motivates the company to engage in CSR implementation (31.3% and 75.14% deviation from the mean, respectively). Companies that have a domestic owner with a foreign investor believe that a better relationship with investors is also one of the most important factors that push a firm to increase its activity in the CSR field (20.35 % deviation from the mean).

Table 3. Drivers of CSR implementation: average scores (financial situation)

Financial situation	DR_CSR_1	DR_CSR_2	DR_CSR_3	DR_CSR_4	DR_CSR_5	DR_CSR_6	DR_CSR_7	DR_CSR_8	DR_CSR_9
Below avarage	1.82	1.91	1.15	1.59	1.97	1.97	1.26	1.00	1.94
Avarage	1.76	1.91	1.33	1.67	1.87	1.90	1.54	1.07	1.90
Above avarage	1.79	1.89	1.74	1.88	1.99	1.96	1.65	1.21	1.95
Very good	1.96	1.94	1.84	1.98	1.99	1.98	1.87	1.17	1.97
Total	1.84	1.91	1.61	1.83	1.96	1.95	1.65	1.14	1.94
Deviation from the mean, %									
Below avarage	-0.65	-0.06	-28.88	-13.17	0.47	0.97	-23.13	-12.43	-0.04
Avarage	-4.27	0.07	-17.63	-8.62	-4.58	-2.64	-6.22	-6.17	-2.16
Above avarage	-2.21	-1.26	8.10	2.81	1.54	0.29	0.27	5.53	0.35
Very good	6.51	1.62	14.25	8.12	1.40	1.33	13.37	2.33	1.25

Source: own research, 2020

Table 3 represents the respondents' answers according to their financial situation. It can be argued that companies with worse financial situation state different answers than firms with better wealth. In particular, only firms that pointed out to have below average and average financial situation indicate that better relationships with investors and the desire for environmental protection do not motivate the company to perform CSR.

Moreover, block ENV_P interprets respondents' answers about the level of CSR activities implementation at the environmental pillar. Respondents had the opportunity to rate their practice in the proposed activities ranging from 1 to 5. Number 1 indicates that the company does not carry out the proposed activity at all, while number 5 means that the

enterprise performs it at a high level and on an ongoing basis. It can be concluded that companies, regardless of their form of ownership or the financial situation of the company's existence, perform the proposed actions in the environmental field at almost the same level. It should also be pointed out that such activities as minimising environmental impacts, waste sorting, waste minimization and water-saving are performed at a high level among all surveyed companies. On the other hand, promoting cooperation with other companies in the environmental field and research and development in the field of environmental protection is performed by almost no respondents.

Block EC_P interprets the respondents' answers about their activities in the direction of the CSR economic pillar. Irrespective of ownership, financial situation or company's existence, all respondents demonstrate rather good results in the implementation of economic measures. However, it should be noted that the surveyed companies are not interested in implementing such CSR activities as innovations in sales business activities, taking into account the ethical principles of trade and providing benefits to disabled customers.

Overall, it can be concluded that all respondents are implementing CSR measures at a fairly high level. This may be explained by the fact that most of these measures are controlled under law and are undertaken by businesses to avoid violations of the law.

The question about CSR social pillar was divided into 2 blocks. Block SOC_P (w) reflects the respondents' responses to work policy. The research shows that all the surveyed companies are trying to ensure a high level of workplace policy. Compliance with labour standards, safety, and health protection in the workplace are the main actions in this area. The high level of enterprises’ interest in this direction means that companies value their employees and seek to provide the best work conditions.

Block SOC_P (c) interprets respondents' responses linked to policy towards the community. The activities related to this component of CSR are carried out at a deficient level among companies of the investigated sector. However, the purchase of raw materials and resources from local businesses is an activity that all respondents implement at a relatively higher level than other measures aimed at cooperation with the community. Moreover, companies with a good financial situation show a much better level of CSR activities’ implementation than those that have stated their financial status as "below average".

Summary, recommendations

Understanding CSR's importance pushes businesses to assume not only the behaviour of law-abidingness, but also to carry out voluntary participation in the implementation of corporate contribution to the development of the community, the territory, and establishing social partnership relations with the state [Burja & Mihalache, 2010].

Research shows that companies in a better financial situation perform CSR activities at a higher level than companies with low financial indicators. It is important to pay attention to the Block SOC_P (w) indicators, which present the respondents' responses to work policy. These activities are mostly carried out only by companies in a good financial situation. Based on the obtained research data, we can agree with previous studies [Ding et al., 2019; Fauzi & Idris, 2009] and confirm our hypothesis 1. The study showed that the activities within the CSR economic pillar are performed at the highest level. This situation can be explained by the fact that most of these measures are controlled by law and are performed by businesses to avoid law violations. Based on this information, we can confirm the validity of previous studies [Okhrimenko & Ivanova, 2015; Sardak & Shmyhovska, 2017; Kolk & Van Tulder, 2010; Lusch & Vargo, 2014; Perera & Chaminda, 2013]. Thus, hypothesis 2 is confirmed.

It should also be pointed out that such activities as minimising environmental impacts, waste sorting, waste minimization and water-saving are conducted at a high level among all the surveyed companies (RQ1). The research shows that all the surveyed companies are trying to ensure a high level of workplace policy. Compliance with labour standards, safety, and health protection at the workplace are the main actions in this area. The purchase of raw materials and resources from local businesses is an activity that all respondents implement at a relatively higher level than other measures aimed at cooperation with the community (RQ2). Irrespective of the form of ownership, financial situation or company's existence, all respondents demonstrate rather good results in the implementation of economic measures, such as fair trade, processing of invoices on time, solving complaints with shareholders, suppliers and business partners etc. (RQ3).

It should be noted that our research has some limitations. For example, the sample strictly came from the food sector. Future studies for further analysis and comparison can explore CSR perception and awareness in other business sectors with distinctive features. A low number of answers is one of the main limits in the research (107 filled questionnaires

out of 546 sent). What is more, the research was not conducted at the enterprises that are oriented on customers with low income. It can be explained by the fact that foodservice businesses that focus on customers with low income do not have web pages or e-mails. Due to that, ways of communication with this market sector are limited.

Due to the strong dependence of CSR development on state support, it would be advisable to create certain regulations for CSR implementation. The creation of awards from the authorities for CSR responsible companies can become one of the stimuli that prompt the company to develop CSR activities. The establishment of CSR training courses in higher education institutions and centres of excellence might play a significant role in spreading ideas and CSR knowledge.

The results have several practical implications for organizations' policymakers. There are several CSR activities that are neutral with respect to the costs. The companies can focus on:

- collaboration with other SMEs. SMEs can more easily find inventive ways of collaborating with other small and medium-sized companies. Helping each other to develop a healthy local economy and sustainable business practices is the kind of involvement that can help the entire community grow;
- organization of charity camps. Enterprises can organize charity camps and encourage the public to donate as much food, clothes or toys as they can, which can later be given away to, e.g., an orphanage or a nursing home;
- organization of masterclasses for children. Small and medium-sized foodservice businesses can use their facilites for events. In particular, such businesses can organize cooking masterclasses for children. This kind of activity could help increase the loyalty of customers who have kids;
- reuse activities. Companies may avoid using disposable plates and cups available to workers. It is possible to supply a kitchen or dayroom for employees with reusable dishes.

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Security of Sustainable Development in the Post-Pandemic Crisis on the Basis of an Inclusive Circular Economy

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Abstract: The study involves the formation of a modern paradigm of sustainable development security in a post-pandemic crisis period, based on an inclusive circular economy. The research is aimed to address the fundamental problem of strengthening the sustainable development security to overcome the effects of the post-pandemic crisis at the micro, meso, and macro levels on the basis of the sustainable, ecological, carbon-neutral economy, in the context of the importance and interdependence of each component in the process of the socio-ecological-economic rise of society. The results of the study will be the development of the theoretical and methodological basis of an inclusive circular economy, scientific and practical justification of approaches to overcoming the effects of the post-pandemic crisis by developing a mechanism to strengthen sustainable development security, and recommendations for possible threats to state food security in the post-pandemic period. The goal of this scientific research is theoretical and methodological substantiation of the formation of an inclusive circular economy and forecasting the capacity of the organic market in Ukraine for economic growth, social justice, environmental management.

Key words: sustainable development security, post-pandemic crisis, inclusive growth, circular economy, state food security, challenges, and threats.

JEL: Q01, Q500, Q56, Q57, R580

Introduction

At present, there are no works that comprehensively addresses the issues of sustainable development in an inclusive circular economy to overcome the effects of the post-pandemic crisis as an integral part of strategies for economic growth, employment

growth and strengthening of the competitiveness of the countries, regions and individual entities, not just environmental problems. The problem to be solved by the project is the need to form a modern paradigm of circular thinking in order to implement a sustainable, environmentally friendly, carbon-neutral economy and develop the mechanism to overcome the effects of the postpandemic crisis based on strengthening the sustainable development security on the basis of inclusiveness, in conditions of imbalances, structural disparities, social, gender and economic inequality, and environmental issues in response to challenges and threats to state food security. The project provides theoretical and methodological justification for the formation of an inclusive circular economy and the forecast of the capacity of the organic market in Ukraine for economic growth, social justice and environmental management. The use of a comprehensive and system-synergetic approach to the formation of a modern paradigm for the formation of an inclusive circular economy and strengthening the sustainable development security to overcome the post-pandemic crisis will allow for the first time in science:

- to assess the risks of the instability of political processes, national macroeconomic imbalances, structural disparities, social, gender, economic inequality, and environmental issues, in response to challenges and threats to national security;
- to develop a methodology for sustainable development security in the post-pandemic crisis, built on the principles of an inclusive circular economy; which is a modern, non-informational paradigm of the spatial organization of social relations, built on the principles of complexity, interdisciplinarity, synergetics, inclusiveness, closed-cycle;
- to improve the conceptual foundations for the formation of sustainable development security and its strengthening at the micro, meso, and macro levels on the basis of inclusive growth, which see the implementation of basic principles of overcoming and avoiding challenges, threats, risks and dangers, the weakness of national security systems within the framework of adequate models of sustainable development with the maximum involvement of society members in the development of social products and ensuring a fair distribution of benefits;
- to form methodological approaches to assessing the security of sustainable development, which are based on the need to achieve inclusive growth, namely involvement in solving development problems of all segments of the population,

entrepreneurship, ensuring equal opportunities for personal development, fair distribution of the received goods, reduction of the population differentiation based on incomes and improvement of the environment quality;

- to forecast the capacity of the organic market in Ukraine as a condition for the transition to a sustainable model of inclusive growth.

Theoretical premises

The spread of COVID-19 coronavirus has revealed the low readiness of many countries to respond to the threats of a large-scale pandemic, demonstrated the imperfection of national sustainable development programs, as well as significant vulnerabilities in various areas due to the pandemic crisis. This determines the urgency of the task of developing and implementing a mechanism for sustainable development security strengthening in order to overcome the consequences of the post-pandemic crisis. The main goal is to form the ability of society and the state to withstand threats of various origins, quickly adapt to changes in the security environment and maintain sustainable functioning, as well as quickly recover from the pandemic crisis to the desired balance.

In this context, the main priority is the synthesis of economic development, inclusive growth, social welfare, and environmental security – the formation and development of a circular economy, which creates new and unprecedented opportunities to increase wealth and prosperity and is the main engine for achieving UN 2030 and sustainable development goals. According to the E. McArthur Foundation, the circular economy will be able to bring more than 1 trillion USD annual income by 2025 and ensure world GDP growth of 7%. The inclusive circular economy is an innovative operational model of sustainable development in a post-pandemic crisis, which provides maximum involvement of the population and business in sustainable development processes in compliance with the principles of greening and resource conservation. With this type of development, value creation is organized in such a way that the outputs of one chain become inputs for another, reducing dependence on new types of raw materials. The production is carried out without excessive consumption of fossil fuels and natural resources.

In the current conditions of the post-pandemic crisis, the introduction of the concept of an inclusive circular economy is important, because it: can be a stimulus for economic

recovery without the application of tough measures; takes into account the diversification of the economy; focuses on the problems of social injustice and ecology; contributes to employment growth. Today, the issues of counteracting possible threats to sustainable development and national security, in general, are intensifying. This raises the question of a comprehensive study of the formation of a modern paradigm of sustainable development security and the development of a mechanism for its strengthening in a post-pandemic crisis based on a circular economy and inclusive growth. This will contribute to equitable opportunities for economic actors, equality of human capital, the ecological state of the environment, social protection, food, and environmental security.

The works of foreign and domestic scientists on the circular economy, sustainable development and inclusive growth are devoted to the following issues: the development of the preconditions for the formation of the circular economy was considered (Heshmati A. [1], Preston F. [2]); analysis of the achievement of goals, objectives, trends, problems and prospects of sustainable development (Chasek P. S., Wagner L. M., Leone F., Lebada A. M., Risse N. [3], Kravtsiv V., Pavlov V. [4], Pavlikha N. [5–9], Skorokhod I. [10-12]); financial aspects of sustainable development (Karlin M., Prots N. [13], Kovshun N. [14]); the role of the concept of inclusive development in achieving the goals of economic growth, social welfare and ecological balance (Gupta J., Vegelin C. [15]); inclusive growth is seen as a concept that provides fair opportunities and equality for economic actors, accompanied by the benefits to each sector of the economy and different segments of society (Ranieri R., Ramos Raquel Almeida [16]); integrated assessment of inclusive development at the national and local levels (Yemelianenko L. M., Petiukh V. M., Dzenzeliuk K. V. [17], Tsymbaliuk I. [18-21]).

H. Brundland defines sustainable development as development that meets the needs of today, but does not jeopardize the ability of future generations to meet their own needs. At the same time, sustainable development is not a preserved state of harmony, but a dynamic process of change, in which the scale of resource exploitation, investment direction, technical development orientation and institutional changes are consistent with current and future needs [22].

V. Burkinskiy, V. Stepanov, S. Kharichkov's sustainable development of the ecological and economic system determines the ability of this system to withstand change, caused by external and internal influences in economic and environmental subsystems, as well as the ability to maintain a certain dynamic equilibrium [23].

Carrez D., Van Leeuwen P. define a closed-loop economy or circular economy as a model of economic development that is based on the recovery and rational consumption of resources and is an alternative to the traditional, linear economy [24].

Sergienko L.V. describes the circular economy as an approach based on the recycling of almost any commodity. By developing and further implementing innovative business models, it will be possible to ensure that technical and biological materials continue to actively "participate" in the economy, and that valuable reserves and natural resources are preserved [25].

In contrast to existing research, there is currently virtually no work that comprehensively addresses the issues of sustainable development security in an inclusive circular economy to overcome the effects of the post-pandemic crisis as an integral part of economic growth, employment and competitiveness strategies, not just environmental problems.

Methodology

The methodology of sustainable development security research in the post-pandemic crisis, built on the principles of an inclusive circular economy, is based on the development of the informal paradigm of social, environmental and economic change to meet human needs, improve the quality of life in wealth, equality and socio-ecological-economic, information, geoeconomic and geopolitical security. Scientific substantiation of the theory and methodology, development of conceptual bases of its strengthening at micro, meso and macro level on the basis of inclusive circular economy in the post-pandemic crisis will be based on regularities (human-centric development, availability and fair use of resources, development of open stationary systems, progress), ecological stability, natural-historical, economic laws of human system formations) and principles (complexity, interdisciplinarity, synergetics, inclusiveness, closed cycle). Their goal is to use the existing and potential opportunities to ensure social, economic, and environmental security, as well as improve the quality of life of present and future generations.

The object of research is the processes of forming and strengthening the sustainable development security in order to overcome the consequences of the post-pandemic crisis on the basis of an inclusive circular economy.

The subject of the research is the theoretical and methodological bases of forming an inclusive circular economy and strengthening the sustainable development security in order to overcome the consequences of the post-pandemic crisis.

The methodological bases of the research are based on the need to achieve sustainable development security on the basis of circular economy and inclusive growth, namely to involve in solving problems of development of all segments of the population, intensification of entrepreneurial activity, fair distribution of benefits, reduction of income differentiation and increase environmental quality. It is planned to adequately assess the existing contradictions, identify destructive trends and causal links, prerequisites, and factors for the formation of sustainable development security and its strengthening at the micro, meso, and macro levels in a post-pandemic crisis.

The analysis of the consequences of the post-pandemic crisis and the preconditions for the formation of an inclusive circular economy and their impact on the sustainable development security on the socio-economic-ecological system is carried out using diagnostic methods, scenario methods, target trees; socio-ecological and economic analysis; diagnostic, morphological, matrix, network, cybernetic methods.

The use of special research methods (abstract-logical, system-structural, computational constructive, comparative and factor analysis, economic-statistical averages and relative values, observation, graphical, cartographic, index, multidimensional analysis; forecasting and software management) will develop and apply methodological approaches to a comprehensive assessment of sustainable development security in a post-pandemic crisis on the basis of an inclusive circular economy, which, in contrast to existing ones, will be based on indicators that characterize these objects as socio-ecological-economic systems; and also allow to determine the factors of their inclusive growth, to substantiate conceptual approaches to the formation of an inclusive circular economy and strengthening the sustainable development security at the micro, meso, and macro levels.

Results

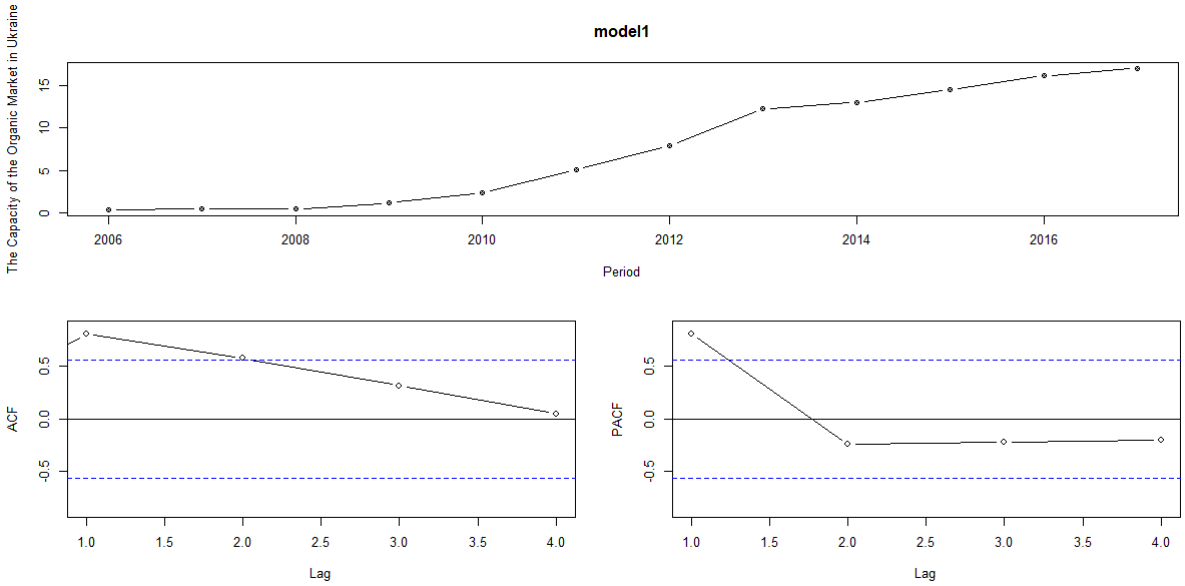
The key target of the closed-loop economic growth is to accelerate the changeover to an inclusive development permanent model. The state food security, the provision of population with environmentally friendly food in order to preserve human health and

to improve the well-being of society, form sustainable development security in the context of a post-pandemic crisis on the basis of an inclusive closed-loop economy. Organically pure products guarantee this safety. Therefore, we have calculated a model predicting the capacity of the organic market in Ukraine.

Models like AR (Auto Regression), MA (Moving Average), and ARIMA (Autoregressive Integrated Moving Average) of several types have been used to create a model predicting the capacity of the organic market in Ukraine and forecasting values for 2019-2021. The analyzed period is from 2006 up to 2017. The smallest value of the AIC criterion, which evaluates errors beyond the selective foresight, is the parameter for the model type selection among others of various classes. The criterion for choosing a model of different classes is the indicator of the smallest error between the predicted and real values of the organic market capacity in 2018. The analysis area is the R programming language. Importing, preparing data and installing the necessary packages are previous steps before creating models.

The autocorrelation function is the correlation of the function value in the *t* period with the function value in the *t-k* period, taking into account the cumulative effects of changes for all the successive periods when to shift the value in the last period. The ACF value for the organic market capacity (depicted in Fig. 1) is slowly falling. The partial autocorrelation function is the correlation of the function value in the *t* period with the function value in the *t-k* period, taking into account the direct effect of the change when to shift the value in the last ones. The PACF function value (shown in Fig. 1) goes beyond the average value range only at the first point.

Figure 1. The Capacity of the Organic Market in Ukraine, the Autocorrelation and the Partial Autocorrelation Functions



Source: own elaboration

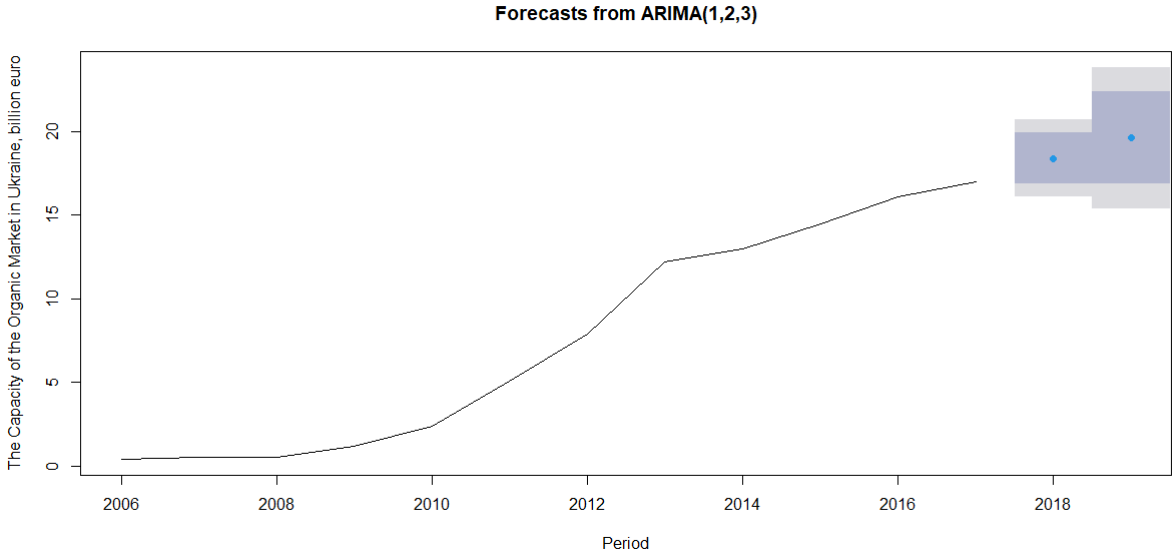
We used all three model types to forecast the organic market capacity and have determined that the ARIMA model, used for the non-stationary time series, is the most accurate. The equations (1, 2, 3) of the ARIMA model will have the following form:

(1) $$y_t = 0{,}4920y_{t-1} - 1{,}0254\varepsilon_{t-1} + 0.3466\varepsilon_{t-2} - 0{,}3212\varepsilon_{t-3}$$

The model constructed herein forecasts the value of the organic market capacity in Ukraine in 2018 and 2019. Graphically, the ARIMA functions (1, 2, 3) are shown in Fig. 2.

The real value of the capacity of the organic market in Ukraine is 20 billion Euro. According to Table 1 small, discrepancies between the points predicted and real values is found using the model ARIMA (0,1,0).

Figure 2. The Model of the Autoregressive Integrated Moving Average ARIMA (1,2, 3) for the Organic Market Capacity



Source: own elaboration

Table 1. Forecast Values of the Organic Market Capacity in Ukraine Based on MA, AR and ARIMA Models (2018)

Year	MA (4)					AR (3)				
	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2018	15.55	13.73	17.37	21,14	18.33	17.15	15.83	18.47	15.14	19.17

Source: own elaboration

Table Continuation

Year	ARIMA(1,2,3)					ARIMA(0,1,0)				
	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2018	18.41	16.90	19.92	16.01	20.72	18.51	16.85	20.17	15.97	21.05

Source: own elaboration

ARIMA (1, 2, 3) was chosen for the forecasting as the most optimal. According to two criteria, the present model is in the second place of efficiency among four others and, taken

in totality of the analysis, the most effective among them. In 2019, the capacity of the organic market was 19.63 billion euros, in 2020 – 20.9 billion euros, and in 2021 – 22.190 bilion euros. Interval and point values concerning the forecasts are given in Table. 2.

Table 2. Forecast Values of the Organic Market Capacity in Ukraine Based on the ARIMA (1, 2, 3) Models (2019-2021)

Year	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2019	19.6261	16.8617	22.3906	15.3983	23.8540
2020	20.899	16.6006	25.1932	14.3263	27.4675
2021	22.1950	16.4019	27.9877	13.3353	31.0543

Source: own elaboration

Thus, models like AR (Auto Regression), MA (Moving Average), and ARIMA (Autoregressive Integrated Moving Average) allow to fully describ the regularity between the time and volume of the organic market capacity in Ukraine and getting an adequate forecast for it. Therefore, if the volume indicator of the organic market in Ukraine continues to be confirmed, then this market will rapidly develop.

Conclusions, recommendations

Most of the research on the circular economy that has been conducted so far focuses primarily on the business model of improving resource efficiency. Scientists emphasize the reuse of materials, as well as the creation of added value through services and intelligent solutions; the need to introduce circular models to reduce the utilization of energy and materials in society in order to achieve environmental safety. The main advantages of the results that will be obtained over the existing ones are the solution to a complex scientific and practical problem of overcoming the consequences of the post-pandemic crisis by strengthening the sustainable development security at micro, meso, and macro levels on the basis of an inclusive circular economy in the process of socio-ecological and economic uplift of the territory. This requires a reorientation of economic and environmental thinking, the creation of fundamentally new mechanisms for sustainable development of spatial socio-economic-ecological systems aimed at ensuring a high quality of life, state food security, acceptable quality of the environment, human development in general.

The study showed that Ukraine has an important potential for the production of organic products, their export and placement on the domestic market. Organic farming is characterized by positive dynamics of increasing production. The development of the organic market will contribute to the improvement of the economic, social and environmental situation in Ukraine, the improvement of the health of the population and the sustainable development of the country as a whole.

Useful and valuable methodological developments of the project will be the development of algorithms and recommendations for overcoming the effects of the post-pandemic crisis and strengthening the sustainable development security on the basis of an inclusive circular economy; recommendations on counteracting potential threats, the security of sustainable development and national security in general. Scientific-practical and applied results of the study will be aimed at solving three main tasks: ensuring the development of energy and resource-saving economy while improving the environmental situation and addressing a number of social issues, especially poverty reduction, as one of the priority goals of inclusive growth.

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Management of financial institutions on the basis of corporate social responsibility as a driver of sustainable development

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Abstract: The article explores issues of ensuring sustainable development by implementing the social responsibility concept in the financial institutions' management system. The research methodology is based on a literature review, expert survey, qualitative case study. The obtained results allow to improve the strategic tools for strengthening corporate social responsibility of financial institutions in the process of ensuring sustainable development, to justify the need to manage the reputation of financial institutions, and to propose an approach to the formation of management decisions taking into account the values and norms of corporate social responsibility.

Keywords: corporate social responsibility, socially responsible initiatives, financial institutions, sustainable development, management

JEL: M1, G22, Q01

Introduction

Financial institutions play a leading role in the processes of economic transformation and ensuring their further development, because the state of the country's financial system directly affects the financial potential of any transformation. Therefore, understanding the importance of the concept of corporate social responsibility and its effective application is extremely important for all financial market participants (both financial institutions and consumers of financial services). This approach will allow to implement the norms of corporate social responsibility in the strategy of development of financial institutions, to create and provide quality financial services, to ensure effective communication with stakeholders. At the same time, responsible consumption of financial services will form and promote a culture of ethical behavior in the financial sector. Such synergetic interaction

of social responsibility of financial institutions and consumers of financial services will create a basis for sustainable development not only of the financial sector, but of the whole country.

Therefore, the purpose of the article is to prove the importance of managing financial institutions on the basis of corporate social responsibility as a driver of sustainable development.

Methodology

The research methodology is based on a literature review, expert survey, and qualitative case study. The authors analyze scientific publications from the Web of Science scientometric database for the period 2001-2020 to reflect aspects of corporate social responsibility of financial institutions, as well as the relationship between corporate social responsibility and sustainable development. This allows to identify specific features of corporate social responsibility of financial institutions, and to systematize the main factors of positive and negative impact on the processes of creation and implementation of socially responsible initiatives.

As a result of the literature review, the authors form a questionnaire for an expert survey, which contains 15 questions. The sample of the expert survey consists of 45 experts, including 27 experts in the field of insurance companies' development and 18 experts in the field of banks' development.

At the same time, the authors use a case study for an in-depth analysis of the practice of applying the concept of social responsibility by Ukrainian financial institutions. The authors focus on the experience of seven banking and insurance companies in Ukraine, which are recognized as the best in the field of corporate social responsibility (Piraeus Bank, PrivatBank, FUIB, Providna, Oranta, ARX Insurance, UNIKA).

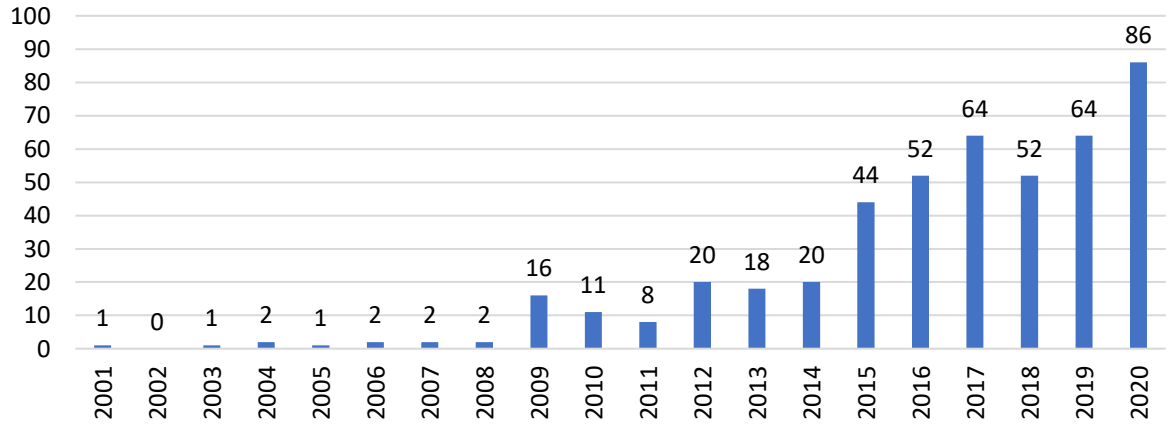
This system of research methods allowed us to identify common and different features of the application of the concept of social responsibility by different financial institutions, as well as to compare them with the experience of experts in the field of financial institutions' development.

Results

The results of the literature review

The analysis of scientific publications from the scientometric database Web of Science for the period 2001-2020 to reflect aspects of corporate social responsibility of financial institutions showed the presence of 466 publications on the research topic. The main categories of Web of Science, according to which scientific publications are distributed, are: business – 177 publications (37.98% of the total), management – 142 publications (30.47%), business finance – 74 publications (15.88%), economics – 70 publications (15.02%). It should be added that since 2015, the number of publications has increased significantly (Fig. 1). Analysis of publications by type of document shows that the vast majority of publications are articles (387 publications or 83.05% of the total), and a significant number of publications are proceedings papers (65 publications or 13.95% of the total). The geographical distribution of publications is as follows: USA (62 publications or 13.305% of the total), Spain (60 or 12.876%), England (50 or 10.730%), Malaysia (46 or 9.871%), Peoples R China (39 or 8.369%), Australia (28 or 6.009%), Italy (22 or 4.721%), Germany (19 or 4.077%), France (18 or 3.863%), Canada (16 or 3.433%), Netherlands (15 or 3.219%); scientists from other countries have published less than 3% of publications. At the same time, almost all publications are written in English (438 publications or 93.991% of the total), and also belong to the field of research "business economics" (344 or 73.820%).

Figure 1 Dynamics of the number of publications on corporate social responsibility of financial institutions in the scientometric database Web of Science for the period 2001-2020



Source: own elaboration

The study confirms the relationship between corporate social responsibility of financial institutions and sustainable development, as every fifth publication combines these concepts. For example, experts show that there is a link between environmental policies pursued by financial institutions and the choice of investors [Galletta, 2021]. Research shows that thanks to regulatory and government support through mechanisms such as green protocols and social and environmental responsibility policies, private financial institutions in Latin America have begun to develop both social and green financial products [Mejia-Escobar, 2020]. At the same time, a study of more than 150 institutions in 20 countries found significant differences in the application of the concept of corporate social responsibility between different types of insurers and between countries, and that social and ethical aspects of CSR are better integrated into insurers' business than environmental aspects [Scholtens, 2011].

It should be added that researchers link the issue of socially responsible investment with the level of development of corporate social responsibility in the business environment and the country's ability for sustainable development [Strizhov, 2017]. At the same time, the results of the study also showed that it is external pressure, in particular from consumers, that can motivate financial institutions to improve the quality of corporate social responsibility reporting [Darus, 2015]. As a result, adherence to the values of sustainable development leads to positive changes in the economic performance of financial institutions, especially during the financial crisis [Stankeviciene, 2014]. Researchers have proven the importance of social impact, social and sustainable finance and ethical behavior in the financial services market, as well as the need to engage and create useful tools for sustainable development, such as social and environmental projects [Secinaro, 2021].

At the same time, experts focus on a number of factors that limit the ability of financial institutions to implement socially responsible initiatives: market crises [Calinescu, 2020; Polinkevych, 2016; Polinkevych, 2021], the need to find additional sources of funding [Khovrak, 2013; Grzebyk, 2015], focus only on the main activity [Trynchuk, 2011], low level of transparency [Zimon, 2019; Baranovsky, 2020], low level of cooperation in the market [Glonti, 2021], insufficient interest in corporate social responsibility practices of non-financial sector companies [Cincalova, 2017; Cincalova, 2020]. However, experts emphasize that raising awareness of corporate social responsibility and sharing experiences can accelerate the implementation of the concept in the development strategy of financial institutions [Finogenova, 2020; Kaigorodova, 2020]. This approach requires cooperation with higher

education institutions and the creation of awareness-raising programs on corporate social responsibility [Calinescu, 2017; Finogenova, 2020; Kaigorodova, 2017; Polishchuk, 2019; Sitnicki, 2018]. Experts argue that intersectoral cooperation and the formation of management decisions taking into account the values and norms of corporate social responsibility can lead to sustainable development of the company, region and country [Kasych, 2018; Kasych, 2020; Onyshchenko, 2020].

The results of a survey among representatives of financial institutions

As corporate social responsibility is an integral part of the strategy of successful business development, it is important to study the practices of corporate social responsibility of financial institutions. In order to determine the specifics of the application of the social responsibility concept by financial institutions in Ukraine, an expert survey was conducted among experts on the development of insurance companies (27 respondents) and banking institutions (18 respondents). The online tool Google forms was used in the present study with consumers of financial services from Ukraine. The mean age of the experts was M = 43.23 (SD = 10.04). The participants subdivided into 77.1% males, and 22.9% females.

The sample of experts is distributed as follows: among the respondents from insurance companies, 81.5% were representatives of risk insurance companies, and 18.5% – life insurance companies; 33.3% of banking institutions are representatives of state banks, 66.7% – private. Also, 74.1% of respondents from insurance companies, and 83.3% from banking institutions work at companies with more than 10 years of experience.

According to the survey results, 74.1% of insurers and 83.3% of banks met the concept of corporate social responsibility. However, representatives of the financial market perceive corporate social responsibility differently (Table 1).

Table 1. Forms of perception of corporate social responsibility by representatives of financial institutions, %

Answer options	Banking institutions	Insurance companies
compliance with the law	33.3%	7.4%
long-term activities that should be related to the business strategy	83.3%	33.3%
popular tool for creating an image based on social participation factors	66.7%	59.3%
way of doing business for mature financial institutions	66.7%	14.8%
control tool	16.7%	3.7%
communication tool	50.0%	18.5%
tool for comparing results with other companies (including competitors) or a benchmark	16.7%	7.4%
volunteering and assistance in social projects	16.7%	3.7%

** results of own survey*

Insurance companies perceive corporate social responsibility as a popular tool for creating an image based on social participation factors, and banks perceive corporate social responsibility as a long-term activity that should be related to the company's business strategy. It is important that 50% of respondents from banking institutions answered positively to the question "Does your company implement a strategy of corporate social responsibility?" (Table 2).

Table 2. Does your company implement a corporate social responsibility strategy?, %

Answer options	Banking institutions	Insurance companies
yes	50.0%	11.1%
rather yes	16.7%	37.0%
difficult to say	33.3%	22.2%
rather not	0.0%	22.2%
no	0.0%	7.5%

** results of own survey*

Among the main motives that prompted the insurance companies and the banks to implement corporate social responsibility in the business strategy, 37.0% of respondents from the insurance sector and 83.3% of respondents from the banking sector noted international experience (Table 3). However, only 11.1% of insurance companies and 50% of banks develop corporate social responsibility reports.

Table 3. The main motives that prompted financial institutions to introduce corporate social responsibility

Answer options	Banking institutions	Insurance companies
activity of competitors	16.7%	3.7%
PR	33.3%	7.4%
stakeholder assistance (clients, partners, communities, etc.)	16.7%	14.8%
decisions of owners / investors	66.7%	33.3%
international experience	83.3%	37.0%
conducted a survey	0.0%	3.7%
institution development strategy and its mission	0.0%	7.4%

** results of own survey*

The vector of corporate social responsibility, according to 55.6% of respondents from expert insurers and 66.7% of banking experts, is aimed at customers and partners: honest and transparent relationships, strict compliance with commitments, quality of provided services (Table 4). At the same time, 44.4% of respondents from insurance companies and 50% from banks believe that the priority is employees: creating decent working conditions, investing in team growth, providing opportunities for training and development, maximizing the potential of each employee (providing employees with equal opportunities, on the basis of the most objective assessment of their contribution to business success; continuous training of staff with the involvement of both internal and external resources).

Also, 44.4% of respondents from insurers, 83.3% from banks believe that the vector should be aimed at the state and the community: to promote sustainable development of society, including initiate the implementation of best practices in the management of the industry in Ukraine (participate actively in government and industry working groups, establish cooperation with educational institutions and international programs; regularly publish articles in the media on topical issues, etc.). According to 16.7% of banking representatives, various formats of stakeholder interaction are also relevant.

Table 4. Distribution of respondents' answers to the questions: Which stakeholders of the company study the impact of CSR activities?, %

Financial institution	regularly	rather regularly	irregularly	rather irregularly	doesn't study	difficult to answer
employees						
banking institutions	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
insurance companies	22.2%	22.2%	7.4%	7.4%	14.8%	26.0%
customers						
banking institutions	66.6%	16.7%	0.0%	0.0%	0.0%	16.7%
insurance companies	22.2%	18.5%	11.1%	7.4%	11.1%	29.7%
contractors						
banking institutions	66.6%	16.7%	0.0%	0.0%	0.0%	16.7%
insurance companies	18.5%	7.4%	11.1%	11.1%	14.8%	37.1%
environment						
banking institutions	66.6%	16.7%	16.7%	0.0%	0.0%	0.0%
insurance companies	14.8%	3.7%	14.8%	7.4%	14.8%	44.5%
regional community						
banking institutions	49.0%	16.7%	16.7%	0.0%	0.0%	16.7%
insurance companies	7.4%	7.4%	11.1%	18.5%	14.8%	40.8%
society						
banking institutions	66.6%	33.3%	0.0%	0.0%	0.0%	0.0%
insurance companies	11.1%	3.7%	11.1%	22.2%	18.5%	33.4%

** results of own survey*

The results of the survey show that 37% of insurance companies react to environmental and social problems because they are forced to take care of solving these problems through rules and regulations; however, 29.6% of insurers and 100% of banks voluntarily put forward and implement pro-environmental and pro-social initiatives. First of all, in achieving the goals, the insurance companys is guided solely by social utility, according to 48.1% of respondents; and banks are guided by a value that equally involves the development of business strategy and corporate social responsibility strategy, the combination of profit and social activities to solve social problems, according to 83.3% of respondents.

However, there is a rather low level of study of the impact of socially responsible activities of insurance companies on the main stakeholder groups, in contrast to banking institutions. The main practices and motives for implementing the concept of corporate social responsibility are given in Tables 5 and 6.

Table 5. Distribution of respondents' answers to the questions: Examples of good practices in implementing the concepts of corporate social responsibility (multiple choice of up to 5 answers), %

Answer options	Banking institutions	Insurance companies
socially responsible investments	50.0%	3.7%
volunteering of company employees	66.7%	22.2%
ethical programs for employees	66.7%	11.1%
measures aimed at protecting the environment	100.0%	22.2%
social (non-financial) reporting	33.3%	3.7%
socially responsible marketing technologies	16.7%	3.7%
financing of kindergartens and schools	0.0%	7.4%
assistance to orphanages	33.3%	40.7%
support for student and research activities at universities	66.7%	22.2%
providing material assistance to individuals	33.3%	48.1%
support for sports events	100.0%	63.0%
social campaigns to promote a healthy lifestyle	50.0%	33.3%
road safety campaigns	0.0%	11.1%
assistance to schools	3.2%	0.0%
assistance to sick children	3.2%	0.0%
support for nursing homes	0.0%	3.7%

** results of own survey*

Table 6. Distribution of respondents' answers to the questions: Benefits of implementing measures related to corporate social responsibility (multiple choice of up to 5 answers), %

Answer options	Banking institutions	Insurance companies
growing interest from investors	50.0%	18.5%
market leadership	50.0%	22.2%
improving the image of the institution	83.3%	48.1%
increasing sales of financial services	33.3%	22.2%
building good relationships with stakeholders	100.0%	33.3%
opportunities for employee development	50.0%	51.9%
strengthening employee loyalty	50.0%	33.3%
increasing consumer confidence	83.3%	51.9%
clean environment	66.7%	25.9%
solving social problems	100.0%	33.3%
smiles and happiness of children	50.0%	18.5%

** results of own survey*

Experts identified three common reasons for banking institutions and insurance companies for insufficient implementation of the concept of corporate social responsibility, namely: lack of knowledge about the concept of CSR (16.7% and 40.7% of respondents, respectively), lack of appropriate legislative incentives (16.7% and 33.3%), excessive costs for

the institution (16.7% and 25.9%). The results of the survey showed the need to promote the tools of corporate social responsibility, which would include familiarization of representatives of financial institutions with the concept of social responsibility and best practices of corporate social responsibility (both global and Ukrainian).

Case study results

The results of the survey confirm the existence of significant differences in the priorities and tools for applying the concept of corporate social responsibility among consumers of financial services. Therefore, for in-depth analysis, the authors use a case study for seven companies that are market leaders in social responsibility in Ukraine.

It should be noted that the development of socially responsible companies in the financial sector of Ukraine took place within the framework of the Financial Sector Transformation Project. The implementer of this project was the DAI Global LLC during October 28, 2016 – August 27, 2021 [FST Project]. This was a four-year program, the main task of which was to develop and improve the provision of financial services in Ukraine that would meet the needs of citizens of Ukraine and businesses of all sizes. In partnership with the Government of Ukraine, regulators and financial sector associations, NGOs and the private sector, the FST Project sought to:

- increase confidence in the banking system, improve citizens' understanding of it and increase the level of use of banking services;
- transform the legal and regulatory environment of the financial sector;
- increase access to finance for small and medium enterprises;
- expand access to financial services for all segments of the population and strive for more active use of digital financial technologies in the financial services market of Ukraine;
- maintain the balance and stability of the pension system.

The Project's activities included the provision of technical assistance, development of regulations, organization of study tours, trainings and acquisition of information technology systems in certain quantities.

Piraeus Bank

Piraeus Bank is headquartered in Athens, Greece, with more than 10.9 thousand employees [Piraeus Bank]. Today, Piraeus Bank is the leading bank in Greece, with a 30% credit market share and a 29% deposit market. In Ukraine, the Piraeus Bank Group began operations in September 2007, following the acquisition of the International Commercial Bank. Piraeus Bank Group is a socially responsible company that attaches great importance to corporate social responsibility, including corporate governance, social work, cultural heritage preservation and environmental balance. Piraeus Bank Group perceives corporate social responsibility as a voluntary commitment to include in its business practices social and environmental actions related to all stakeholders (employees, shareholders, partners, suppliers, investors, consumers, etc.). The group implements its social obligations in such areas as corporate governance, social policy (cooperation with NGOs in such areas as "Child", "Family", "Health", etc.), cultural policy (carried out through Piraeus Bank Group Cultural Foundation) and reduced its energy consumption and rational use of natural resources based on environmental management programs. Piraeus Bank also became the first bank in Greece to create a special area of "green lending" Green Banking, which aims to support and finance businesses that implement "green" technologies.

PrivatBank

PrivatBank is a socially responsible bank that employs people with disabilities (4% of the total number of employees). The bank employs 22 thousand people, net profit for 2020 is UAH 25.3 billion [PrivatBank]. The staff receive an average salary 10% higher than staff at other banks. In addition, PrivatBank provides employees with a full social package, annual paid leave for 24 calendar days, a system of soft loans for housing and cars, legal advice, security of employees and their families (program "Protection"), discounts on corporate communications. The bank identifies itself as a green bank, which has electronic document management, ecological collection technology, subbotniks, financial literacy and programming at JuniorBank, business seminars for entrepreneurs, and videos with financial consumer advice. The bank has established a charity fund "Help simply", which regularly helps boarding schools, children with cancer, victims of natural disasters or terrorist attacks, conducts a charity event "Ordinary Miracle". In cooperation with the United Nations Children's

Fund (UNICEF), Privatbank delivered 100 oxygen concentrators to 34 Ukrainian hospitals in 11 oblasts during the COVID-19 pandemic at the expense of its own charitable foundation.

The First Ukrainian International Bank

The First Ukrainian International Bank (FUIB) has been conducting responsible business for over 29 years, investing part of its profits not only in the development of the bank and staff training, improving the quality of products and services for customers, but also in developing the business environment and improving financial literacy. The company has 208 branches with 7,485 employees, 1.5 billion UAH in taxes were paid at the end of 2019 and 429 million hryvnias were spent on development [FUIB]. In 2019, the company invested UAH 61.3 million in training and development of employees (Management Development Program "School of Management", Knowledge sharing program, Institute of Internal Coaching; invested UAH 29 million in 2019), strengthening staff health, improving the quality of products and services, business environment development (project "Praise to the hands that smell of bread", "From parents to children", "Farmers' Financial Guide") and the development of local communities, improving financial literacy (FUIB Bank game station in the online city of professions "Kidlandia", financial literacy magazine "Finance from A to Z" and coloring "Journey of small money"), development of corporate volunteering (All-Ukrainian Day of Good Deeds, actions #GenerousTuesday, Donor Days , shares Lots of Socks, "Rays of Happiness", "Run under the chestnuts"; invested 201.8 thousand UAH in 2019). The Bank has declared the principles of corporate ethics and prepares annual progress reports.

Providna

Another socially responsible company is the insurance company, "Providna", which is designed to preserve and care for the well-being of every resident of Ukraine, offering affordable, necessary and quality insurance products. The company has been operating on the Ukrainian market since 1995 [Providna]. The company's regional network consists of 24 branches, 22 Customer Service Centers in different regions of Ukraine, its own Contact Center, in total the company has more than 2,000 employees. Corporate social responsibility is represented through charity, environmental practices, corporate training and cooperation with education institutions. Providna supports 25 orphanages; has held actions "Share the

heat" (since 2013), "All-Ukrainian subbotnik" (since 2012), "Alley" Providna (since 2010); is the sponsor of the All-Ukrainian Insurance Olympiad and All-Ukrainian competition of scientific works of young scientists on insurance. The company regularly conducts motivational trainings ("learn to teach", "public speaking", "training in etiquette and business style"), promotes leadership development, training "Golden Reserve", distance and specialized training system, insurance agent school. In 2020, the company launched insurance against coronavirus "Stop. Coronavirus" in three variants in the amount of 15, 30 and 50 thousand UAH.

Oranta

Oranta is the largest insurance company in the classic insurance market of Ukraine, which in December 2008 signed the United Nations Global Compact and publicly declared its commitment to the principles of socially responsible business. Oranta cooperates with professional Ukrainian and international organizations in the field of CSR, participates in the work of committees and working groups of the American Chamber of Commerce and the European Business Association [Oranta]. According to the results of the independent rating, Oranta Incorporated received the highest A + rating among socially responsible companies. The priority in the activities of Oranta is the issue of orphans in Ukraine and the promotion of Ukrainian sports. Also, at the end of 2008, the company launched a project to implement the practices of the Green Office. A green office is a concept of managing an organization that reduces its negative impact on the environment by maximizing the conservation of resources and energy and reducing waste. Oranta as a market leader feels directly responsible for the future of the state, seeing its mission in the development of a society confident in the future. Corporate social responsibility at ORANTA is not a fashion trend. This is exactly the approach that the company has been following for 98 years.

As part of the social responsibility program aimed at working with staff, Oranta initiated a project to train young employees without work experience with further employment in the company (since 2013). This program is designed to enable Ukrainian youth to get their first official paid work experience, in addition, the project will strengthen public interest in working in the field of insurance and show the prospects of a career in the insurance market in Ukraine. The initiative helped the company expand its personnel reserve and

replenish its staff with talented young employees. As a result, in April 2019, the company took the 2nd place among the most socially responsible companies in the financial sector and the 28th place among all Ukrainian companies in the all-Ukrainian rating of corporate social responsibility of Ukrainian business, "Guardia".

ARX Insurance

In 1994, ARX Insurance began its history with the establishment of the insurance company VESCO, in 2000 – the Ukrainian Insurance Alliance. In 2007, the French group AXA acquired both companies, assessing their European level and potential. This led to the creation of the largest player in the market - ARX Insurance. The company has been operating in the Ukrainian market for 26 years, 11 of which have been under the ARX brand, demonstrating stable growth, bright innovations and a real example of improving the customer experience. In 2019, the Canadian insurance holding Fairfax Financial Holdings, which is present in 40 countries, has become a new investor. Fairfax is a powerful international insurance and reinsurance holding company that continues to grow rapidly in its most potentially attractive countries. The company pays its customers about UAH 4 million every day [ARX]. The company has supported an initiative aimed at improving the lives of Ukrainians since childhood. The project "Healthy nutrition for children" (since 2018) aims to foster a conscious attitude to food and to form a habit of leading a healthy lifestyle. There is also a free service for insured persons: online consultation with doctors. The insurance company has developed a Code of Business Conduct and Ethics, an anti-corruption program and a policy. The company offers a mobile game for drivers in order to reduce the number of accidents (from November 2020). During the game, the client will understand how to properly resolve the accident - call the police, use the European protocol. After the game, the client can go to the site and find Auto-Civil "Smart Drive", which allows to save if the client is a good driver. At the same time, Fairfax Financial Holdings Limited, recognizing the unprecedented impact of the COVID-19 pandemic, donated $ 80,000 to hospitals in Ukraine to help with the purchase of necessary protective equipment for physicians. The company has introduced telemedicine, a remote medical consultation that has been available since 2017. This service is possible for both primary and secondary medical consultation. The consultation takes place by phone, chat

or Skype, then the client receives a formal advisory opinion. After the service is provided, the assistance representatives must contact the insured for feedback and medication.

UNIKA

UNIKA Insurance Group is represented in Ukraine by the non-banking financial group UNIKA Ukraine, which includes the insurance companies UNIKA (non-life) and UNIKA Life (life). UNIKA Ukraine has 200 sales offices, 28 regional directorates, 15 general representations, 36 partner banks, 30 types of insurance licenses, more than 1,000 employees, 1,300,000 insurance contracts and 900,000 active clients.

As part of corporate social responsibility, UNIKA Insurance Company has launched the Refusal of Plastics project in cooperation with one of the largest corporate clients in health insurance, Nova Poshta. This initiative will make it possible not to pollute the environment, avoiding the production of more than 23 thousand cards, equal to 115 kg of plastic, which later require recycling. In addition, this project implements the requirements for contactless transmission of information, which is especially relevant today.

In March 2020, at the beginning of the coronavirus quarantine, UNIKA Ukraine joined the charitable project of Bolt (passenger transport service) to provide free travel for medical workers. More than 3,000 medical workers took advantage of free travel to work from UNIKA. In April 2020, the Lviv Regional State Administration initiated a social project and involved UNIKA as a partner to provide health insurance to physicians in the Lviv region who work with infected patients in case of contracting COVID-19 virus [UNIKA]. The project helped create a stabilization fund that provided benefits to 32 physicians hospitalized with a confirmed diagnosis and a positive PCR test. The total amount of payments of the company for physicians is UAH 480 thousand.

Conclusions and limitations

Analysis of a sample of 466 articles demonstrates a multidisciplinary vision of mechanisms for ensuring corporate social responsibility of financial institutions in terms of sustainable development.

The results of the survey of financial services experts show that 77.8% of respondents are knowledgeable about the concept of social responsibility. Most respondents believe that

the main forms of corporate social responsibility of financial institutions should be the implementation of social programs to improve working conditions, training and staff development, charitable assistance, the use of ethical principles, environmental projects, and information companies to improve financial literacy. The results of the survey also showed the need to promote tools and the best cases of corporate social responsibility among representatives of financial institutions.

The results of the case method confirm that most financial institutions identify corporate social responsibility with the creation of charitable foundations for social work, preservation of cultural heritage, environmental protection and staff training. All companies determine that the application of corporate social responsibility forms positive goodwill, helps to find highly qualified staff, and establishes relationships with local authorities.

At the same time, the main differences in the application of the concept of corporate social responsibility are the beneficiaries of social projects aimed at protecting various social groups (children, early primary and mature working age, the elderly). Oranta implements projects for young people and people of early working age. In addition, only FUIB pays attention within the framework of social responsibility to the development of the ethical component of relations with stakeholders. Social responsibility is not a mandatory element of the development strategy in all companies (except for Oranta) and the function of monitoring the implementation of social programs (all companies) is not adjusted. The focus shifts to the main external partners of companies in the development of corporate social responsibility programs from local governments to international (Oranta, PrivatBank) and public organizations (FUIB). Only Piraeus Bank, PrivatBank and FUIB believe that corporate social responsibility contributes to long-term stability, expands markets, helps to find new partners and increases investment attractiveness. Accordingly, banks are focus mainly on profiting from the implementation of projects in the framework of social responsibility, when insurance companies are focusing on promoting their activities and seeking to gain the affection and trust of stakeholders.

The obtained results allow to improve the strategic tools for strengthening corporate social responsibility of financial institutions in the process of ensuring sustainable development, to justify the need to manage the reputation of financial institutions, and to propose an approach to the formation of management decisions taking into account the values and norms of corporate social responsibility.

Ensuring sustainable development depends on the conscious implementation of the principles of corporate social responsibility in the development strategy of financial institutions, systematic, balanced and consistent activities in the field of social responsibility. The main aspects that require increased attention of financial institutions are:

- identifying the needs of stakeholders (not only internal but also external);
- establishing a bilateral dialogue with stakeholders;
- defining the target audience and priority areas of corporate social responsibility programs;
- creation of a division and involvement of experts for development and implementation of programs and measures on corporate social responsibility;
- informing about activity in the field of corporate social responsibility (development and dissemination of reports on social responsibility and sustainable development in accordance with international standards of non-financial and integrated reporting, signing of the UN Global Compact, presentation of cases for national and international ratings on social responsibility and sustainable development).

At the same time, there are some limitations. Ensuring sustainable development also depends on the social responsibility of financial services consumers. Therefore, consumers should focus their efforts on ethical behavior and improving financial literacy. In addition, our conclusions may not be generalizable under different cultural and institutional contexts. The Ukrainian context may share similar characteristics to other Eastern European countries, but may be less applicable to countries with different social and economic traits.

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Rural tourism as a component of the innovative potential of Ukrainian rural areas

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Abstract: Given the rich tourist and recreational resources of Ukraine, it is the development of tourism that should be considered as one of the ways to solve economic, social, and environmental problems. However, the available resource potential is not rationally used, so the study of innovative development prospects of rural tourism is extremely relevant. The article under consideration aims at the analysis of a state of rural tourism as an advanced innovative direction for strengthening of socio-economic development of rural areas by analyzing the level of development of rural tourism in the regions of Ukraine. The objective of the study is rural tourism. The article also casts light upon the evaluative peculiarities of the current level of development of regional tourist - recreational complexes. The notion of a category «innovation potential of a region» has been defined and structurally described. Peculiarities of attractiveness of Ukraine's regions have been determined. The level of development of tourism sector has been fundamentally estimated. Precise mechanisms for promotion of development of rural tourism by foreign countries have been provided. There have been singled out the following problems influencing the development of rural tourism in rural areas of Ukraine: poor auto-transport system, lack of access to Internet, insufficient marketing policy, strong competition with foreign businesses. The time scope in the analysis refers to the period 2018-2020. The following research methods are used in the article: dialectical, monographic, comparison, graphic, statistical analysis, method of integrated indicators construction, abstract-logical, economic modeling. The analysis showed that Ukraine has all the necessary resources for the development of rural tourism. The most promising areas for this type of tourism are Vinnytsia, Volyn, Zakarpattia, Ternopil and Ivano-Frankivsk regions.

Key words: rural tourism, innovative development, tourism, development of tourism, innovation potential

JEL: R11, Z32, Q16

Introduction

Present-day conditions of globalization and the increasing of competition in world markets determine innovative way of economic development as the most urgent and compulsory. This has been caused by intensification of processes in accumulation

and transformation of new knowledge, increasing scientifically-contained products, applying current technological solutions in various spheres.

Innovation development of rural areas is based upon innovative activity of business entities and their perception of modern achievements of science and technology. In particular, a great deal of rural enterprises and farms with high level of mobility and innovative adaptability mainly influences the formation of innovative potential of rural areas. Widespread use of innovations makes it possible to provide the competitiveness of agricultural products in the international market, to promote the organic production, and to overcome a significant number of socio-economic problems, including rural unemployment, low wages [Shevchuk & Shevchuk, 2017, p.28-29].

Methodology

Firstly, the article touches upon the analysis of the development of rural tourism in regions of Ukraine as a result of intensification of innovative processes in rural areas. Secondly, the most attractive areas of Ukraine for development of recreational and tourist infrastructure have been singled out. Finally, the article determines a number of problems which hamper the development of tourism business in rural areas. The activity of leading countries in the field of rural tourism has been briefly analyzed. The present research focuses mainly on the last three years. The analysis of dynamics and structure has been applied.

To achieve the goal of the study, a set of the following methods was used: dialectical – to analyze and comprehend the essence and content of the “innovation potential of the region” category; monographic – to highlight the views of scientists on the studied issues; comparison – to assess the state and dynamics of innovative development of rural tourism in Ukraine; graphic – to illustrate the trends of rural tourism in the regional context; statistical analysis, method of construction of integrated indicators – for ranking regions by the level of development of recreational and tourist complex; abstract-logical – for theoretical generalization and formulation of own conclusions; economic modeling – for the formation of a system of interaction between the state and entrepreneurs to achieve the goals of sustainable development of rural areas through the introduction of product, technological and marketing innovations.

Theoretical aspects of formation of innovative potential of rural areas

Innovative activity in rural areas is represented by a system of measures aimed at implementation of results of research works (other scientific and technical achievements) into a new product or improved technological process, having been applied in practice. The essence of innovative process, that has been oriented onto the development and mastering advanced technique (technology) is composed of the following stages: fundamental research, applied research, research and development works, mastering of advanced technologies.

Innovative policy is intended to provide the achievement of the purpose of innovative process as a set of measures aimed at increasing social and economic efficiency of innovative process in rural areas. Investment policy ,in complex, is a part of state innovative policy, presenting the process of the state's influence on the distribution of resources and formation of productive proportions with a view to stabilize and ensure its sustainable development. This is realized by means of scientifically-grounded forms, methods and levers management, as well as staff qualification and requalification [Hanushchak-Yefimenko & Shcherbak, 2016, p.100].

Current times are characterized by regionalization of innovation processes, precisely by the location of innovation activity in some regions. From this respect, the study of peculiarities of innovation potential of the region becomes urgent.

The concept under consideration is not unanimously interpreted in scientific works. The term «innovation potential» has been introduced by K. Freeman, who considered it as ensuring the development of economic system through innovations. The most common are the definitions of innovation potential as a set of all resources applied in innovation activity.

Taking into consideration the analysis of numerous definitions, it is possible to state that scientists define «innovation potential of a region» as:

- a set of resources (Bilovodska O., Gryschenko O., Trukhin S., Kutsai N.);
- the ability to realize resources (Gorodnytskyi T., Shutenko V., Baklanova O.).

Innovative potential of the region is composed of market, information, financial and investment, production, research and development, marketing, staff potentials (Fig. 1).

Figure 1. Components of innovation potential of the region

Source: [Hotra, Ihnatko 2020, p. 88; Leshchukh 2019]

Market potential indicates the level of appropriateness of innovative ideas and objects of intellectual property to the needs of society and individual businesses in competitive scientifically-intensive products and services.

Information potential represents the level of information support of the region, technical equipment of innovation activity with computers, telecommunications.

Financial and investment potential represents the real state of financial system, which is able to ensure the process of development, implementation and commercialization of innovations.

Production potential is characterized by the presence of innovatively active enterprises, research institutions, labour tools and objects in order to ensure the innovation process in the region.

Research and development potential provides the emergence of innovations and characterizes the scope of research and development work in value and quantity, the structure of these works by sectors of economic activity.

Marketing potential is the region's ability to commercialize research results through the use of available resources, innovation infrastructure and innovation culture.

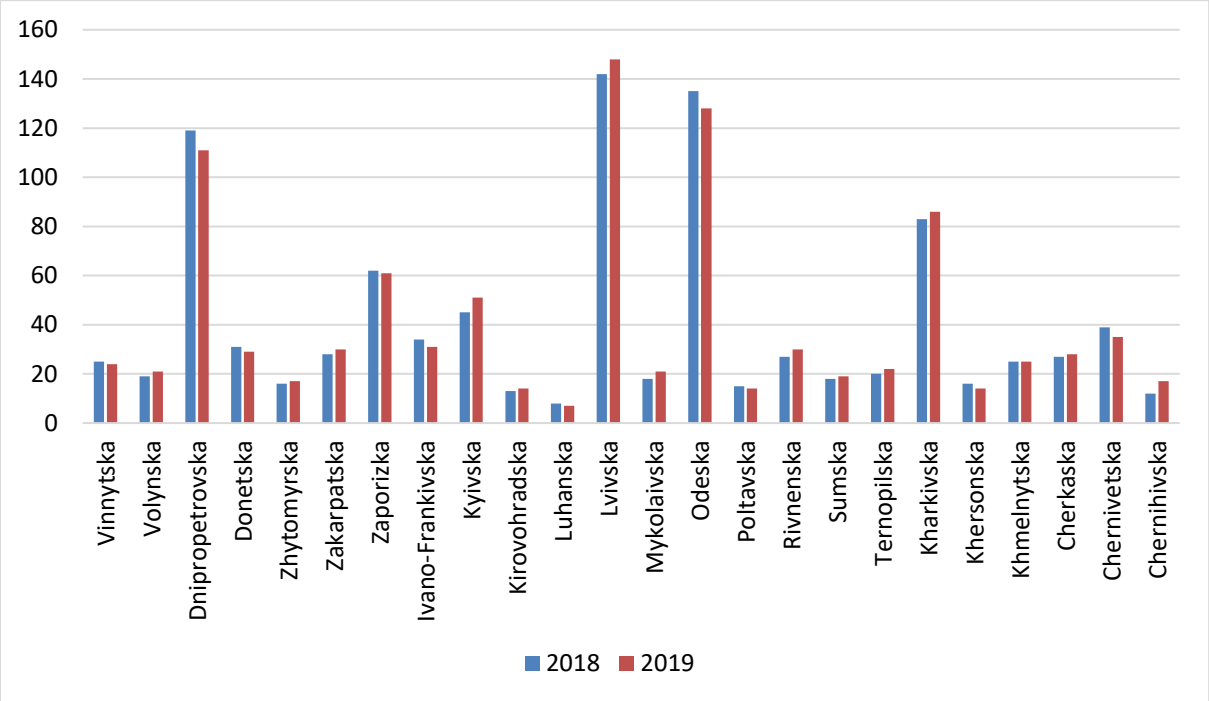
Staff potential characterizes generational opportunities for generation to assimilate and accept new ideas, bring them to the level of technology, equipment, organizational and management decisions.

Results

Innovation process in rural economy promotes the emergence of the following non-traditional business types: agritourism, biotourism, ecotourism, rural tourism, adventure tourism. They contribute to the increase of income of rural population, by means of providing jobs.

Rural tourism can be called one of the drivers of economic development of rural areas [Horban, 2020]. This type of tourism appeared long time ago (15-20 years), but is extremely popular nowadays, since the COVID-19 pandemic has influenced tourism business. People began to relax more and more actively near their homes, in an environmentally friendly area.

Figure 2. Number of subjects of tourist activity of Ukraine (2018-2019)

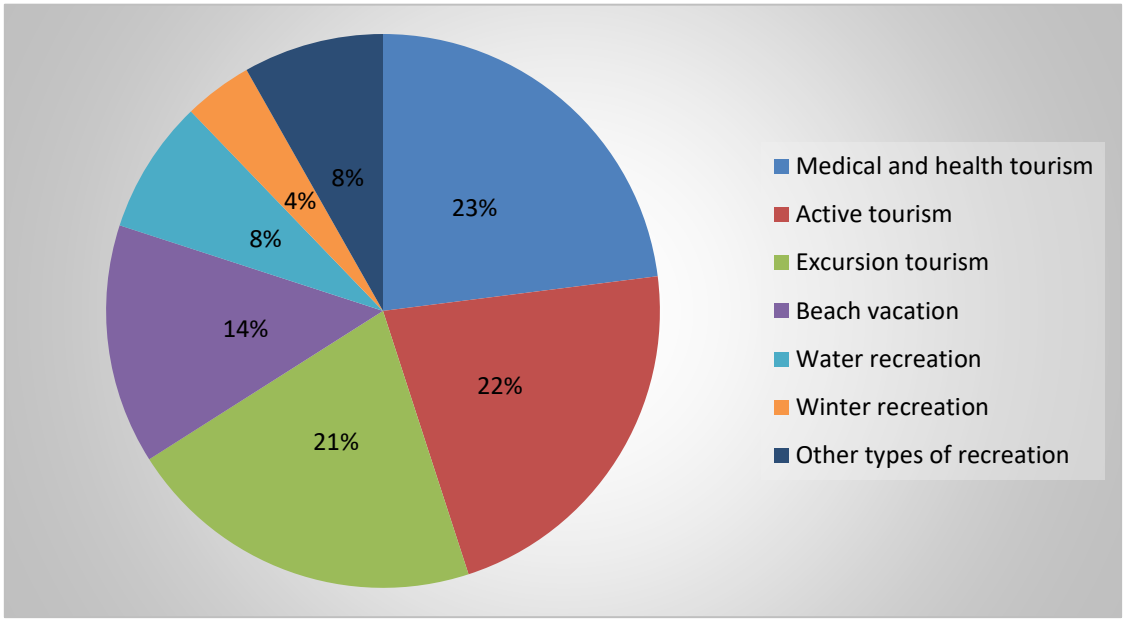


Source: own study, based on the State Statistics Service of Ukraine data (http://www.ukrstat.gov.ua/)

As it is seen in Fig. 2, the highest number of subjects of tourist activity of Ukraine is concentrated in regions of Lviv, Odesa, Dnipropetrovsk, Kharkiv, Zaporizhya, Kyiv and Chernivtsi. In our opinion, this is due to the fact that the largest tourist "highlights" of Ukraine are concentrated in these regions. For example, tourists go to Odessa to relax at the Black Sea; Lviv, Chernivtsi, Kyiv are characterized by beautiful architecture and unique tourist sights; Zaporizhzhia region is washed by the Sea of Azov and is the capital of the Ukrainian Cossacks.

Among the most widespread types of tourism in Ukraine are medical and health (23%), active (22%), excursion (21%) and beach vacation (14%) (Fig. 3).

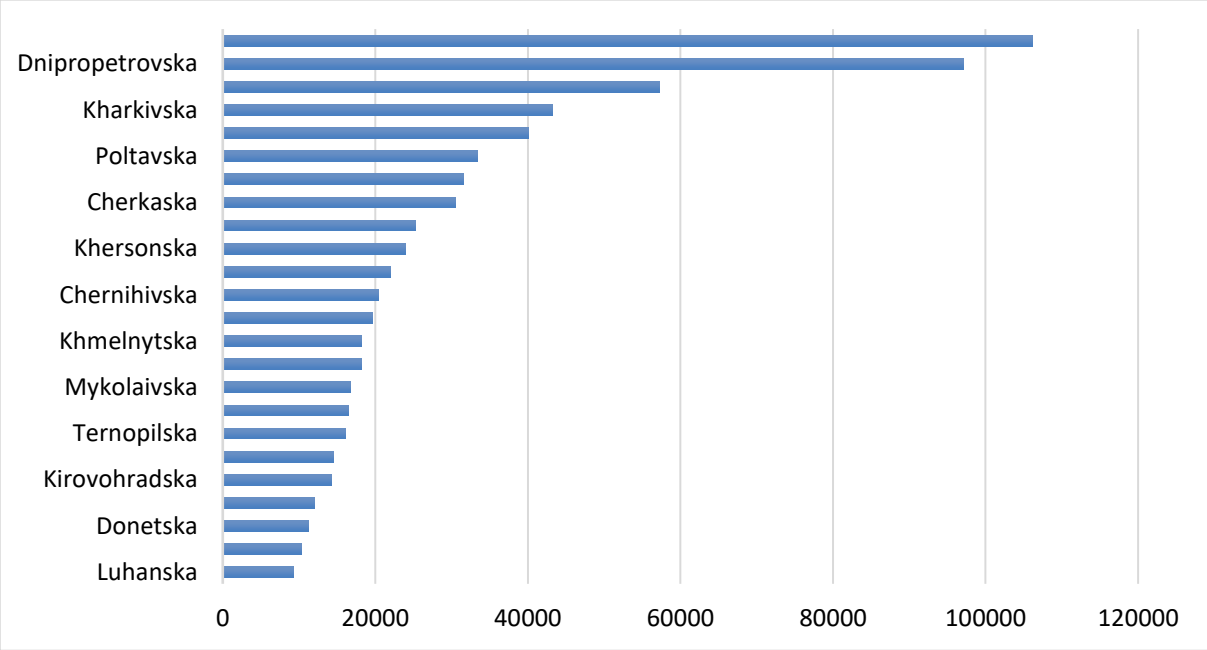
Figure 3. The most common types of tourism in Ukraine



Source: own study, based on the State Statistics Service of Ukraine data (http://www.ukrstat.gov.ua/)

In 2019, the greatest number of tourists was serviced in regions of Lviv (106,220 people), Dnipropetrovsk (97,156 people), Kyiv (57,270 people), Kharkiv (43,190 people) and Odesa (40,132 people).

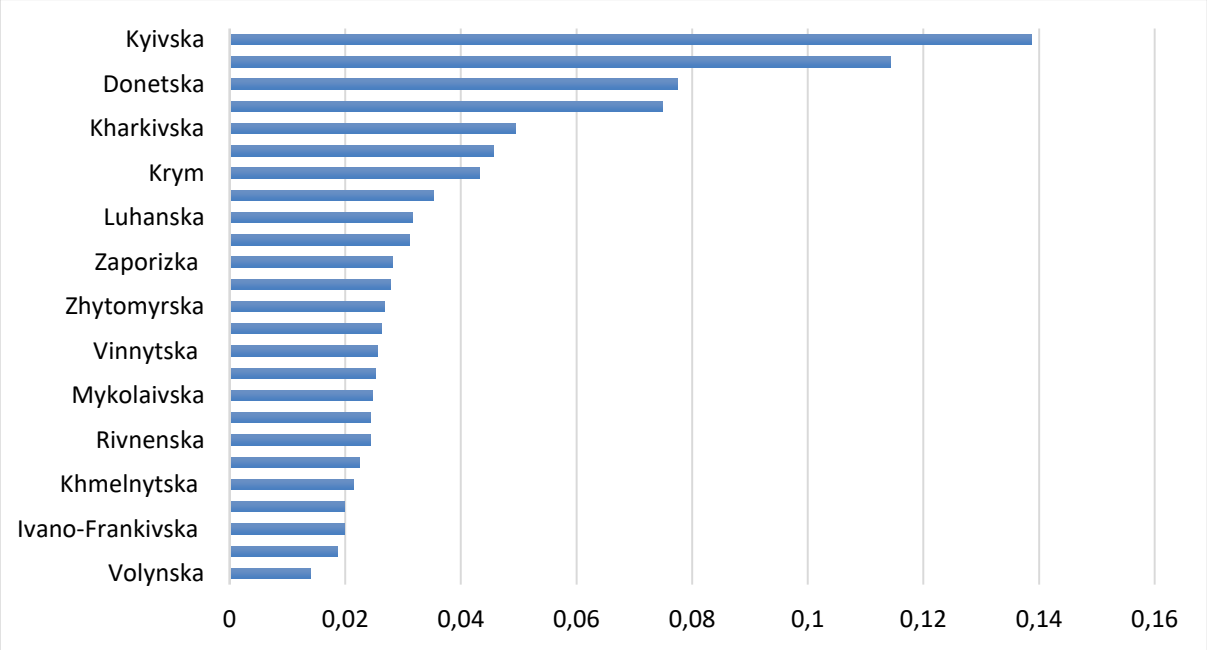
Figure 4. Number of served tourists in terms of regions of Ukraine



Source: own work, based on the State Statistics Service of Ukraine data (http://www.ukrstat.gov.ua/)

Figure 5 represents the ranking of recreational and tourist attraction of regions of Ukraine, with a systemic element of provision of agritourism services.

Figure 5. Ranking of regions of Ukraine by level of development of recreational and tourist complex



Source: own work, based on the State Statistics Service of Ukraine data (http://www.ukrstat.gov.ua/); Shpak 2013

The present ranking has been formed by applying the method of constructing integrated indicators. The essence of this method lies in the idea that for each of the selected indicators, all areas obtain a special rank (place), which is evaluated by the appropriate number of points (higher points for better indicators). Then standardized grades are calculated by dividing the actual grades by the maximum possible. Obviously, obtained marks are on the segment [0,1] and the higher they are, the better position (according to this criterion) is represented in the corresponding region. Integral mark of the level of development of recreational and tourist complex is calculated as an average arithmetic mean of estimates for all indicators.

The following indicators have been selected as indicators of development of recreational and tourist infrastructure: amount of accommodation organizations in the total number of enterprises and organizations; provision with rooms; relation of number of people (served in public accomodations) to the total number of population; amount of catering organizations in the total number of enterprises and organizations; access to museums; access to theatres; access to libraries.

Marks for every region, obtained in accordance with all the indicators mentioned above, have allowed to make a rating of regions on a level of development of a recreational and tourist complex and to single out 3 groups of regions.

Table 1 represents typification of regions of Ukraine by attractiveness for travelers and the level of development of recreational and tourist infrastructure

Table 1. Typification of regions of Ukraine by attractiveness for travelers and the level of development of recreational and tourist infrastructure

		The level of development of recreational and tourist infrastructure		
		High	Medium	Low
The level of attractiveness of regions	High	Lvivska		Vinnytska, Volynska, Zakarpatska, Ternopilska, Ivano-Frankivska
	Medium	Kyivska	Chernivetska	Zhytomyrska, Rivnenska, Khmelnytska, Cherkaska

	Low	Donetska, Dnipropetrovska	Kirovohradska, Luhanska, Odeska, Krym, Kharkivska	Zaporizka, Mykolaivska, Poltavska, Sumska, Khersonska, Chernihivska

Source: [Shpak 2013]

The regions in the first column demonstrate the level of development of recreational and tourist complex close to the limit of their potential, so the return on their additional support will be minimal. In the considered table, the basic cell located at the intersection of the first row with the second column is blank. This is due to the fact, that the high level of demand in regions attractive for development of tourism and recreation has already led to the emergence of some objects of recreational and tourism infrastructure.

Thus, the most promising regions for tourism development, with maximum socio-economic effect of development of recreational and tourist industry, are: Vinnytsia, Volyn, Zakarpattia, Ternopil, Ivano-Frankivsk regions.

Transport connections, the quality of highways in particular, are significant factors that influence the development of rural tourism. Rating of regions of Ukraine by the presence of public roads is depicted in Table 2.

Table 2. Rating of regions of Ukraine by the presence of public roads

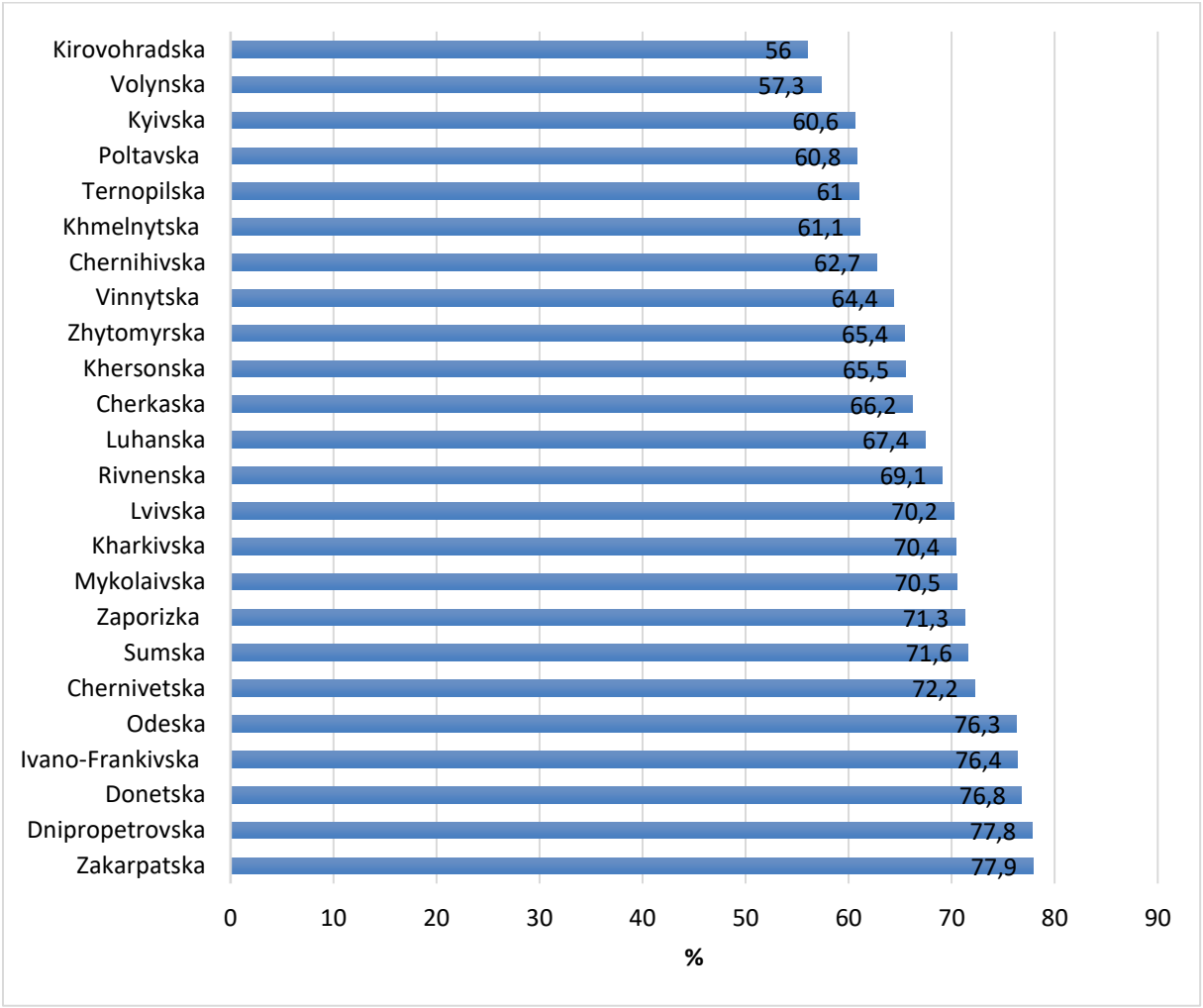
Region	Rating	Region	Rating
Lvivska	1	Cherkaska	12
Ternopilska	2	Dnipropetrovska	13
Vinnytska	3	Zhytomyrska	14
Chernivetska	4	Zakarpatska	15
Khmelnytska	5	Zaporizka	16
Poltavska	6	Rivnenska	17
Volynska	7	Kirovohradska	18
Kharkivska	8	Odeska	19
Sumska	9	Chernihvska	20
Ivano-Frankivska	10	Mykolaivska	21
Kyivska	11	Khersonska	22

Source: own study, based on the State Statistics Service of Ukraine data (http://www.ukrstat.gov.ua/)

As can be seen from Table 2, regions of Ukraine that are promising for tourism development, mainly the Zakarpatska region, are characterized by poor transportation, which greatly complicates access to tourist attractions. However, this problem is currently being solved by the state authorities. In 2020, the project «Great building» was started, with a view to build and reconstruct 6,500 km of roads along the whole country. It is based on the principals of high quality and energy efficiency. Most funds for the program have been allocated in Kyiv (UAH 273 million), Dnipropetrovsk (UAH 214 million), Odesa (UAH 199 million) regions, while the least amount - in Kirovohrad (UAH 24 million), Sumy (UAH 30 million) and Luhansk (UAH 32 million).

One of the factors that hamper the development of tourism business is low number of rural household with access to the Internet (fig. 6).

Figure 6. The share of rural households in Ukraine that have access to the Internet (2019)



Source: own study, based on the State Statistics Service of Ukraine data (https://ukrstat.org/uk/druk/publicat/kat_u/2020/zb/07/zb__dd_in19.pdf)

Rather low level of Internet access is typical for all regions that are promising for tourism development, except Transcarpathian. In turn, this fact reduces their attraction, especially during the pandemic, since most of people work online.

In addition, a strong competition from neighboring countries that offer better infrastructure, connections and extensive use of up-to-date technologies has also been determined as a significant problem referred to the development of tourism industry in Ukraine.

Rural tourism contributes to the solution of a number of problems in underdeveloped regions and is an important element of rural development in many countries. For example, involvement into rural tourism activities is encouraged at the national level in France, the United Kingdom, the Netherlands, Ireland, Germany, and Spain. Countryside vacation is the second most popular holiday activity in these countries, overtaken only by vacations at sea. Rural tourism creates new jobs and brings real income to regions, as well as makes it possible to find means and ways for enviromental protection. In many countries, development of rural tourism has become basic direction in protection and reproduction of rural landscapes.

The formation of rural tourism in Germany began with the concept development in peripheral regions. As a result, the market currently offers cheap outdoor recreation without expensive infrastructure, but with comfortable living conditions.

In Hungary, the law regulates «rural green tourism» relations out of normative regulations in the field of entrepreneurship. Accordingly, personal income of countrymen for providing their own homes for recreation is not taxed. There are also special benefits and advantages for family housholds that are engaged in (or have expressed a desire to be engaged in) activities in the field of rural tourism. This occurs under the condition of their location on the territory of rural settlements in economically underdeveloped (recognized as economically depressed) regions.

These benefits and advantages can be obtained on a competitive basis. These projects can be materially supported in the form of loans (up to USD 8 thousand), which, in case of successful project implementation, don’t need to be paid back.

Latvia has extensive legislative experience in the development of agritourism. This is due to foreigners who are mainly among the contingent of tourists willing to spend vacation in local countryside. The government has immediately focused on this very promising type of tourism, which can solve the problem of unemployment in rural areas, and has

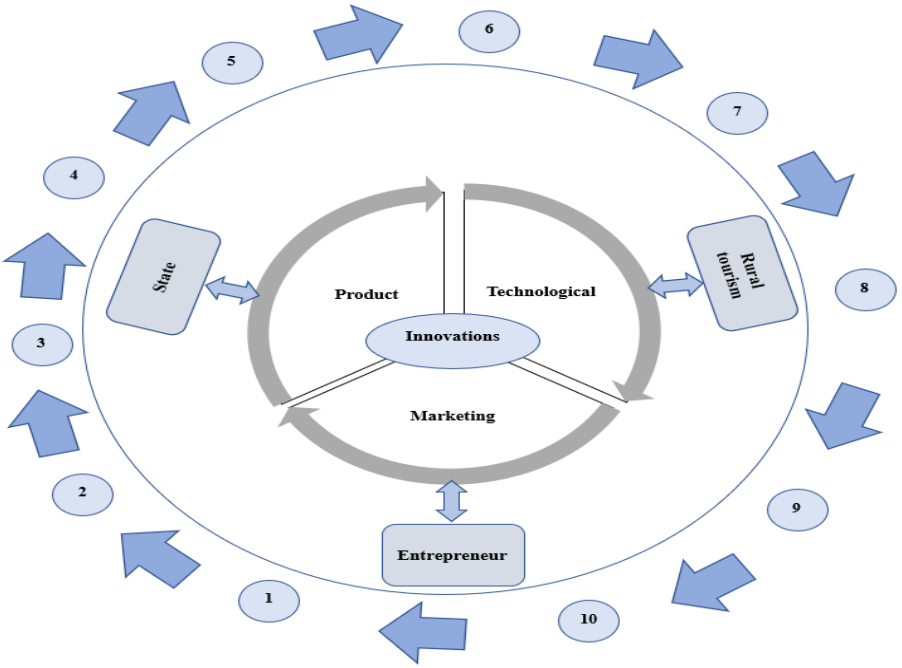
approved a number of relevant standards. According to the Latvian Rural Tourism Association, the number of tourist accommodation establishments in rural areas has increased almost tenfold over the last eight years, and the number of beds has increased in 19 times.

We consider marketing to be an important innovative instrument that contributes to the development of rural tourism. Among its precise components, there are SEO, SMM, context advertisement. Well-balanced marketing policy helps to promote own business online, to sell agricultural products, increase the competitiveness of subjects of business entity.

Bukovel, the biggest ski resort in Ukraine, can serve as a bright example of implementation of innovations in rural areas and development of rural tourism. It successfully competes with foreign resorts, is characterized by a developed infrastructure, effective marketing policy.

In Fig. 7 a model of interaction between the state and entrepreneurs to achieve sustainable development goals through the introduction of innovations in rural tourism is presented.

Fig. 7. Innovative rural tourism in the system of sustainable development goals



**1- overcoming poverty; 2 - reduction of social inequality; 3 - efficient use of natural resources; 4 - clean water and proper sanitation; 5 - renewable energy; 6 - decent work and economic growth; 7 - modern infrastructure; 8 - responsible consumption; 9 - conservation of marine ecosystems; 10 - conservation of terrestrial ecosystems*

Source: own study

We suppose that intensification of innovation in rural areas requires the development of innovative programs that include coordination of organizational issues, creation and implementation of innovative products.

Program goals should be systematically implemented in economic sphere, investment, infrastructure, personnel and information and advisory support of agricultural producers, stimulating the development of fundamental science and intellectual capital, minimizing the risks of innovation [Hotra & Ihnatko, 2017, p. 19].

Rural tourism has definitely testified to be a significant factor for overcoming socio-economic problems of the countryside, particularly the growth of employment in rural areas, the development of rural infrastructure, countrymen obtaining stable and significant income, strengthening the budget of rural settlements.

Summary, recommendations

Intensification of innovation processes contributes to the emergence of new tourism types that are able to bring rural areas into a qualitatively new level of development (agritourism, biotourism, ecotourism, adventure tourism). One of them, according to the State Statistics Service of Ukraine, is rural tourism, which is becoming popular nowadays, since the COVID-19 pandemic has influenced tourism business. It allows to solve a lot of problems of the countryside, namely, unemployment and low material support. Ukrainian mountainous settlements are the examples of successful innovation implementation, resulting in the emergence of competitive business entities. In rural areas, there is the introduction of product innovations, which involve the implementation of business ideas for rural tourism services that are new to the market (Bukovel), the development of new types of tourism; technological innovations that involve the introduction of new approaches in the organization of rural tourism services and their planning using information technology (provision of tourist facilities with high-speed Internet, SEO, SMM, web pages), as well as the introduction of energy and resource-saving technologies; marketing (development of modern models of positioning and advertising of the tourist product and tourist-recreational territories). The introduction of institutional innovations through new ways of cooperation between business entities and various institutions interested in the production and provision of rural tourism services can play an important role in solving the problems of tourism business in rural areas of Ukraine.

The analysis of the state of rural tourism of Ukraine as an advanced innovative direction made it possible to distinguish regions in accordance with their tourist attractiveness. In particular, the regions were divided, according to the level of development of the recreational and tourist complex, into three groups -high, medium, low- considering the following indicators: amount of accommodation organizations in the total number of enterprises and organizations; provision with rooms; relation of the number of people (served in public accomodations) to the total number of population; amount of catering organizations in the total number of enterprises and organizations; access to museums; access to theatres; access to libraries. The prospective regions include: Vinnytsia, Volyn, Zakarpattia, Ternopil, Ivano-Frankivsk. While the Zaporizhia, Mykolaiv, Poltava, Chernihiv, Kherson, and Sumy regions are considered the least promising.

There are many problems in the development of rural tourism in Ukraine. The biggest obstacles hampering the development of tourism in rural areas, according to the State Statistics Service of Ukraine, are considered the remoteness of recreation centers, poor auto-transport system, lack of good advertising, low level of service provision, lack of integrated tourist offers of products for a new type of tourist and great competition from neighboring countries.

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The level of happiness as a determinant of sustainable development

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Abstract: The happiness index is not taken into account among the components of the measurement system for quantitative and qualitative assessment of sustainable development. The article substantiates the possibility of using the happiness index as a determinant of sustainable development. The author suggests that achieving happiness is the ultimate goal of controlled social, economic and political systems, and the level of happiness can be used to measure the level of sustainable development. To compare the dynamics and outline the direction of movement, the subjective component of happiness index is decomposed as follows: stress, life values of individuals and life satisfaction. The author proposes to consider the needs of end users of sustainable development depending on the views on content of happiness. According to the author, the generalized classification of the archetypes of happiness is as follows: hedonism, eudaimonia, rat race, nihilism, subjective well-being. These typologies of happiness and their carriers do not exclude the necessity to meet the needs as devised by Maslow, however, they significantly expand the range of attention of public authorities and state policy regarding their variability. In terms of marketing, different archetypes of happiness and their representatives are different customer groups, meeting the needs of which allows to better solve the problem (achieving happiness) of user, enterprise, organization and society as a whole. The author believes that further research consists in studying the needs (primary and secondary, absolute and relative, higher and lower, positive and negative, general and special, urgent, private, individual and group, etc.) and developing an assortment matrix of services for each archetype; research of existing experience and development of practical ways of using available resources to ensure the opportunity for next generations to be happy; development of conscious attitude to the fact that natural resources are common to all living things on the planet and that all creatures great and small also require meeting their needs (in their diversity); creation of an appropriate scientific and practical platform for bringing together like-minded people – representatives of different areas of activity.

Key words: sustainable development, happiness index, needs of end users, views on content of happiness

JEL: Q01, Z18, R58

Introduction

Ideas of controlled evolution, design and management of the future are developed by scientists in various fields of science. This refers to human-driven changes in the desired direction. Thus, the conflicting interaction of humanity with nature and, as a possible consequence, the death of mankind, is today opposed to the idea of managed sustainable development on the basis of selected principles of its achievement. Despite the fact that sustainable development is studied quite deeply (for example, Popkov, 2007; Sadovenko, Sereda & Maslovskaya, 2009), the dynamics of sustainable development is determined by changing objective indicators. Population is seen as a social mass that must be mobilized to achieve the goals of sustainable development, while the subjective perception of the population (peoples, groups, individuals) is not taken into account.

On the other hand, the comparison of the dynamics of development of different countries is increasingly based on the so-called happiness index. Our previous research on the happiness index has concluded that the subjective component is also not taken into account when calculating the happiness index.

Thus, despite the fact that sustainable development and the happiness index are studied separately by different authors, the level of happiness as a determinant of the level of sustainable development has not become an independent object of research. The latter made the direction of scientific research particularly relevant.

Theoretical premises

Management of the future in the form of the concept of sustainable development, in particular, its environmental content, originates in the works of V. Vernadsky. He came to the fundamental conclusion that between all living and non-living parts of the globe there is a continuous material and energy exchange, which is expressed by natural changes and constant strive for stability and balance (Vernadsky, 1994). V. Vernadsky, A. Subetto and other researchers note the transition of the modern form of coexistence of the biosphere and anthroposphere in the noosphere, in which the human mind, in the cosmoplanetary dimension, becomes the "mind of the biosphere" focused on its progressive evolution (Vernadsky, 1994; Subetto, 2007). Nonlinear changes and processes of self-organization that occur in an unstable society are studied within the framework of social synergetics. According to the theory of intelligent systems, the concept of "intellectual management" (management of the macro-society and its subsystems: nano-, micro-, mili-societies) is introduced into scientific vocabulary (Subetto, 2007). In the context of these theoretical approaches, the concepts of sustainable development of society and national happiness become of particular interest.

The beginning of the global partnership for sustainable regional development was established at the UN Conference in Rio de Janeiro (1992). At this conference, on the basis of the report "Our Common Future" by the International Commission on Environment and Development ("Brundtland Commission"), there was adopted an important document for the world community - "Action program. The agenda for the XXI century" (General Assembly of the United Nations, 1987).

According to the Brundtland Commission's definition, "sustainable development means development that meets the needs of the present but does not jeopardize the ability of future generations to meet their own needs."

From the point of view of research, the following principles of achievement of sustainable development attract attention:

- The most important goals of environmental policy should include preserving peace, boosting economic growth, changing quality of the economic growth, tackling poverty, meeting people's urgent needs, tackling demographic challenges, preserving and strengthening the natural resource base, reorienting technology and taking into account risk factors, as well as comprehensive approach to environmental and economic issues in the decision-making process.
- A fair distribution of environmental costs and benefits of economic development between and within countries, as well as between present and future generations is one of the key factors in achieving sustainable development.

The term "Gross National Happiness" (GNH) was coined in 1972 by Sikko Mansholt, one of the founding fathers of the European Union and the fourth president of the European Commission. It is no coincidence that the anthem of the European Union is an instrumental part of the song "Ode to Joy": music by Ludwig van Beethoven (Symphony No. 9, first performed in Vienna in 1824), lyrics by Friedrich Schiller (written in 1785).

In 2005, the International Institute of Management first proposed the Gross National Wealth and Happiness Index (GNW / GNH). (International Institute of Management, n.d.). The GNW/GNH Index has been proposed to help identify and assess socio-economic development.

On July 18, 2008, the Bhutanese Constitution adopted the Bhutanese Government's Index of Gross National Happiness as the goal measurement of the government's activity (The Constitution of the Kingdom of Bhutan, n.d.). This term corresponds to the Buddhist idea that the ultimate goal of life is inner happiness. The components of gross national happiness are: economic self-sufficiency, pristine environment, preservation and promotion of Bhutan culture and good governance in the form of democracy.

Methodology

Based on the analysis of the identified sources, we took the statement about the control of human change in the desired direction as a methodological basis. Sustainability and sustainable development are manageable, and there are objective and subjective mechanisms, algorithms and technologies that allow to regulate these processes.

We have made a number of assumptions:

- the way to achieve happiness is to meet the needs of end users of sustainable development;
- a sense of happiness is the ultimate goal of managed socio-economic and political systems, and the level of happiness can be used to measure the level of sustainable development.

Since objective indicators (for example, the level of GDP per capita, etc.) are taken into account when determining the dynamics of changes in sustainable development and the happiness index, the subjective components of happiness have been chosen as the focus of the research. Taking into account the subjective components of happiness will make it possible to compare the dynamics of change in sustainable development and plan further development. We have proposed the following components of the subjective component of happiness: stress, life values of individuals, life satisfaction.

Because of the assumption that meeting the needs of end users of sustainable development is the ultimate goal of managed socio-economic and political systems, an attempt was made to identify above-mentioned needs based on views on happiness (hedonism, eudaimonia, rat race, nihilism, subjective well-being).

Results

In the context of the issue under consideration, in our view it was important to consider the components of the measurement system (indices and indicators) for an objective and subjective assessment of sustainable development. As you know, the main requirements for this system of measurements are its information, completeness and adequacy of the interconnected triad of components of sustainable development (economic, environmental and social). Despite the ambiguity and inconsistency of the systems of measurement of sustainable development available to the author, the analysis of the

systems revealed that among the system of Sustainable Development Commision of the United Nations (SDC UN) indicators, there are several distinguished indicators of institutional aspects of sustainable development (programming and policy planning, research, international legal instruments, information support, strengthening the role of key populations). The latter makes it possible to identify the direction of progressive development - the orientation of countries' policies to create economies on the model of "welfare for all" (Zgurovsky, 2006). The pan-European indicators of sustainable urban development (SUD) include "citizens' satisfaction with the city" (Mazurov & Pakina, 2003). Also, the use of the index of human well-being is gaining momentum (Matrosov, 2000). However, the proposed calculation of sustainable development does not take into account the happiness index.

The World Happiness Report is compiled annually as part of a UN initiative (Helliwell et al., 2020). The happiness index is calculated on the basis of objective indicators. Jury members take into account indicators such as GDP per capita, social support, life expectancy, people's sincerity, perceptions of corruption, etc., without taking into account the feelings of happiness of the actual people. As a Ukrainian, the author was interested in the dynamics of the Happiness Index of Ukraine for 2006-2019 (Fig. 1).

Figure 1. Dynamics of the Happiness Index of Ukraine for 2006–2019

Source: own study, based on (Statistical Appendix for Chapter 2 of World Happiness Report 2020 John F. Helliwell, Haifang Huang, Shun Wang, and Max Norton February 29, 2020. P. 15)

The dynamics of happiness indices for 2006–2019 is indicative for every Ukrainian. The bar chart recorded a decrease in the happiness index in Ukraine in 2014–2016. Also low in previous years, the rate of happiness in Ukraine decreased with the beginning of Russian aggression, the annexation of Crimea, hostilities in the Donbass. It is logical to assume an increase in stress for most Ukrainians. Thus, we can hypothetically record a direct

relationship between stress and happiness: the higher the stress, the less happiness people feel.

However, such calculations are proposed from the point of view of objectivists, top managers, management geniuses, few of whom know how to measure the sustainable development of all (the whole world, all people). This corresponds to the view that discoveries are made by individuals - geniuses, and the rest are the ones who follow the geniuses. This view is not ideal, however. As history shows, the geniuses can be both positive and negative.

As reporters, we present the results of a study of the happiness index, which is conducted by the Association of Independent Research Agencies Gallup International. In Ukraine, the survey was conducted in early December 2020 by the Kyiv International Institute of Sociology [Cheromuhina, 2021]. In this study, the happiness index is calculated as the percentage of those who consider themselves happy, minus the percentage of those who consider themselves unhappy, i.e., calculated solely based on the subjective feelings of respondents. The answers of the surveyed Ukrainians showed a sharp decline in the subjective feeling of happiness compared to the previous year: in 2019 - 33%, in 2020 - 14%. Obviously, the 2020 pandemic was another stressor that was evident. The limitation of the applied method is that its results can be considered relevant only for the situation "here and now." The limitation of the applied method is that its results can be considered relevant only for the situation "here and now," because the internal "local feeling of happiness" can be influenced by situational, unconscious factors. In addition, being as subjective as possible, this system of measuring happiness captures the state but does not specify the direction of development.

We have proposed the following aspects of the subjective component of happiness, which can overcome the limitations of the previous ones: happiness will be a component of the dimension of sustainable development and will be constructive (meaning it will allow you to compare the dynamics and determine the direction of further development). In our opinion, the subjective component of the happiness index can be decomposed as follows: stress, life values of individuals, life satisfaction (Samarska & Sas, 2020). According to G. Selye, stress is a non-specific response of the body to any requirements imposed on it (Selye, 1977).

During stressful periods, along with elements of adaptation to strong stimuli, there are elements of tension and even damage. It is the universality of the "triad of changes" that

accompanies stress: the reduction of the thymus, enlargement of the adrenal cortex and the appearance of hemorrhages and even ulcers in the gastrointestinal mucosa, allowed G. Selye to hypothesize a general adaptation syndrome (GAS), which was later called " stress."

As has been mentioned, stress is accompanied by a decrease in the thymus, enlargement of the adrenal cortex and the appearance of hemorrhages and even ulcers in the mucous membrane of the gastrointestinal tract. That is, an increase in the mordibity of the population of any country under the influence of these functional changes in the human body may indicate a social, economic, political tension in society, and thus - a decrease in the subjective feeling of happiness. Life and freedom are recognized as the most important and most significant values. Therefore, a comparison of indicators of duration and state of human rights and freedoms will indicate the level of happiness in a country. Awareness that every ordinary citizen of any country is the end user of living standards in the country leads to the understanding that the degree of his or her satisfaction can also be used to assess social progress (sustainable development) in the country.

It makes sense to anticipate the ability to control the level of subjective happiness. Such opportunities are opened on the basis of achievements in the field of neurobiology.

The famous experiment conducted by American behavioral psychologists James Olds and Peter Milner in 1954 is based on a study of the sense of pleasure and neural correlates associated with its receipt. As a result of the experiment, an important part of the brain called the "pleasure center" was discovered (Olds & Milner, 1954). The experiment involved rats with electrodes implanted in the limbic system sitting in a special box. Even when the animal was able to self-regulate the feeling of pleasure by pressing the lever, the effect persisted. Seeking to experience pleasure again and again, the rat pressed the lever, ignoring the actions necessary for survival (for example, denying himself food) until it died of exhaustion.

The experiments with the implantation of electrodes in the human brain in the area of the "pleasure center" were considered unethical. However, the study of "pleasure centers" led to the discovery of a substance released in the brain in the process of pleasure - dopamine (and the ability to enhance its secretion, for example, through exercise).

The study of Japanese scientists opens the possibility to objectively measure the feeling of happiness using magnetic resonance imaging (Sato, Kochiyama, Uono, Sawada, Kubota, Yoshimura & Toichi, 2016). In particular, statistical analysis revealed a correlation between the level of happiness and the amount of gray matter in one area of the right

hemisphere - the inner part of the parietal cortex (precuneus). It was found that the precuneus has connections with other brain structures and is involved in integrating information about current inner feelings, memory of the past and plans for the future. The new discovery is likely to enable the development of methods that develop people's sense of happiness through meditation. According to some studies, meditation increases the amount of gray matter in the precuneus.

It is worth noting that the principle of sustainable, balanced development is identified as a key principle of all EU policies (Treaty of Amsterdam amending the Treaty on European Union, the Treaties establishing the European Communities and certain related acts, 1997). According to the Amsterdam Treaty, any EU policy should be designed to take into account economic, social and environmental aspects, and achieving goals in one area of policy should not hinder progress in another. From the point of view of the concept of happiness, the achievement of sustainable development is nothing but the work of public authorities focused on the end users of public policies in their economic, social and environmental aspects.

Recognition of happiness as a determinant of sustainable development also has an ethical meaning, as it is a shift in the value orientations of many people. Like any social ideal, the recognition of happiness as a determinant of sustainable development is a guide to the creation of a society whose policy (economic, social, environmental aspects) is the happiness of the population of each country and the planet through human needs (economic, social, environmental) (Kotler, 2006).

Let's consider what is a need in terms of typology of happiness. The generalized classification of archetypes of happiness, in our opinion, is as follows: hedonism, eudaimonia, rat race, nihilism, subjective well-being (Sas & Samarska, 2020).

Hedonism (from Greek "pleasure") enjoys simple pleasures: fallen leaves in the park, moments of intimacy with friends or hugs with a dog (Kozlowski, 2017). The creator of the theoretical foundations of the hedonistic attitude to life and happiness is usually called the ancient Greek philosopher Epicurus. It was hedonism, based not so much on living in complete indulgence of whims, but on moderate pleasures, self-control and respect for others. Humans are creatures that have a significant need for pleasure, enjoyment of life; the absence of such pleasure narrows their spiritual horizons.

Eudeimonia identifies happiness with the development of personal abilities: a "happy" life consists of realization of a person's potential (moral, intellectual, social, etc.) and their development. The belief in happiness-eudaimony underlies the ethical concept of Aristotle, according to which the state of happiness implies the desire of the individual to meet their own vocation ("Damon") or "true self." It occurs through the development of all possibilities inherent not only in typical personality characteristics but also in specific personality traits represented in any human individual (Kargina, 2019).

Rat race means the pursuit of financial well-being, career building, success, victory in competition, etc (similar to the image of a laboratory rat running through a maze and receiving pieces of cheese as a reward). Those for whom this way of living is ideal and acceptable, feel quite happy.

Nihilism (from the Latin "nihil" - nothing) means denial of established social norms, values, authorities, ideals. Kropotkin P. is credited with defining nihilism as a symbol of the struggle against all forms of tyranny, hypocrisy, and artificiality, as well as for personal freedom. In different years and in different countries, atheists, youth subcultures of punks and hippies, etc., were considered nihilists. Jean Baudrillard and others characterized postmodernism as a nihilistic era or way of thinking (Baudrillard, 2000). Values in postmodernism are freedom, diversity, tolerance and a view of a society where "all are authors and actors." Nihilists, in our opinion, can be identified as individuals who are able to live in a state of alternativeness, to be in a situation "between" (reassessment of values, reorientation of goals, etc.). In the context of this problem, not only in the situation of renewal and self-manifestation, but also the renewal of the surrounding society.

The basis for understanding the content of subjective well-being is contained in the psychological theory of subjective well-being by E. Diener (Diener & Ryan, 2009), and M. Seligman's concept of authentic happiness (Seligman, 2006). Personal, special cognitive, and emotional-evaluative interpretations of the situation determine the direction of activity of such a person in the form of behavioral strategies. Such a person is said to be "on their wave." The assessment of the external circumstances of such a person's life may not contradict the generally accepted norms, but may not depend on them. To a certain extent, subjective well-being is the essence of Eastern practices (according to the Japanese budo expert M. Saotome “... to know oneself means to know the mission that Heaven has assigned to you”) (Saotome, 2002).

Summary, recommendations

These typologies of happiness and their carriers do not exclude the necessity to meet the needs according to Maslow. However, they significantly expand the range of attention of public authorities and state policy regarding their variability. In terms of typology of happiness, implementing an electrode or practicing meditation is not enough. For example, comfortable and beautiful housing, clothing, food and other are important for hedonists; this should provoke the development of appropriate industries and their stimulation (not only safe, but also beautiful and aesthetically pleasing). For eudemonists, it is important to have conditions for development of various abilities – moral, intellectual, social, etc. The task of public authorities is to create appropriate opportunities, conditions and access to them. The participants of "rat race" are able to maintain a fast pace in achieving goals, but obviously require high service (food, healthcare and education facilities, technical services, etc.) (not only safely, but also quickly). We assume that the developed service will attract the attention of representatives of other behavioral typologies of happiness. All participants of the society are, at the same time, consumers and producers of goods and services. Thus, the main task of the state is to support and encourage constructive and limit destructive activities (in terms of compliance with laws, environmental feasibility and sustainable development). We assume that in any country and in any society, there are representatives of different archetypes of happiness; we also assume that typology of archetypes will develop over time.

In terms of marketing, different archetypes of happiness and their representatives can be simply considered as different customer groups, meeting the needs of which allows for better solution of the problem (achieving happiness) of a user, enterprise, organization and society as a whole. We believe that further research consists of studying the needs (primary and secondary, absolute and relative, higher and lower, positive and negative, general and special, urgent, private, individual and group, etc.) and developing an assortment matrix of services for each archetype; researching existing experience and development of practical ways of using available resources to ensure the opportunity for next generations to be happy; development of conscious attitude to the fact that natural resources are common to all living things on the planet and that all creatures, big and small, similarly to humans require meeting their needs (in their diversity); creating an appropriate scientific and practical platform for bringing together like-minded people – representatives of different areas of activity.

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Institutional and financial support of the development of rural areas

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Abstract: In this article, particular aspects of institutional and financial support of development of rural areas have been considered. Law and legislative approaches towards regulation of powers and cooperation of public authorities with local governments and a particular territorial community have been generalized. It has been indicated that regional aspect of formation of institutional and financial component for support of rural areas development is being substantiated by the Concept of steady development of rural areas of Transcarpathian region along with the Transcarpathian Region Development Strategy, which had already been determined until 2027. Beside necessary is security of practical realization of connection of investigation costs, especially state financial support of projects for rural areas' growth and developing a state system for attracting the unemployed in rural areas and distant mountain sub-regions using up-to-date information technologies are extremely urgent but critical. This idea is extremely urgent in the quarantine caused by COVID-19. Analytical and problem aspect of support for rural areas development on the example of a definite region (Transcarpathia) has been highlighted. The experience of foreign countries in promotion of rural areas' development has been studied. An emphasis has been placed upon the necessity to distinguish the problems of rural areas' development, which impede extended notion of investigated areas.

Key words: institutional support, financial resource, rural areas, authorities collaboration

JEL: Q14, G28, R51, O18

Introduction

The territory of the country plays an important role in its the economic. The practical aspect of the designated role of the pole in the multifunctionality of the agricultural development of the agricultural development is directed to increasing welfare and well-being of rural residents, production of organic (ecologically pure) agricultural products, expansion of production and preservation of ecologically clean territories.

The capacity of the last update of the development of the country's territorial systems is necessary, some of these territories will occupy 90% of the territory of the state, apparently on the forest and lisovkrit area - 17.6% (10.6 mln.ha) [Borshchevskyi, Prytula, Krupin, & Kulish, 2011; Land directory of Ukraine, 2020].

The importance of rural areas is also outlined in the Sustainable Development Strategy of Ukraine until 2030, which states the need to increase investment in rural infrastructure, agricultural research, technology development, and ensure the proper functioning of food markets, in particular by reducing market risks for agricultural producers and diversification of market instruments [Strategy of sustainable development of Ukraine by 2030. Project, 2017, p. 10].

At the same time, current approaches towards support of efficiency for functioning of subjects of agrarian economy in particular and rural areas' development as a whole determine the necessity for interaction of state institutional and financial support for investigated territories. Collaboration and implementation of powers performed by Public Administrative Bodies, namely regional (district) level, Regional and Local Councils, Local State Administrations, Settlement Councils, City Councils and their executive bodies enable to form an effective institutional component, the success of which is achieved due to the synergistic effect of interdependence of these bodies, giving impetus to the balanced development of rural areas.

Methodology of the research

In the process of scientific research, empirical research methods were used, in particular, a comprehensive generalization of institutional and legal approaches to ensuring the development of rural areas. The study used a selective method to identify effective factors of influence to achieve the effectiveness of rural development in the future. The descriptive-analytical method made it possible to substantiate the results of the study considered through the prism of the problematic aspect of rural development. The application of applied and prognostic methods to the study, including the information method, allowed to substantiate the existence of a legal framework to ensure the effective functioning of agricultural entities, and in general the development of rural areas, as well as the method of morphological

analysis, funds and interaction of institutional and financial support of the studied territories by the state.

Scientific and practical approaches to the formation of development of rural territories

Scientific and theoretical and practical approaches to resolving the problematic issues of institutional and finantial provision of development of rural territorial system and separation of factors of influence the aim of increasing the result of given process to the large extent considered in scientific literature. Especially, the specificity of legislative regulation of issues concerning development of market land relations, implementation of market circulation of agricultural lands, investigation of scientific and theoretical, normative and regulatory fundamentals with a view to provide market transformational changes in agricultural sector of Ukraine's economy and to form capital market for financing the sphere of agricultural enterprise have been widely reflected in the works of native outstanding scientists, namely Yu. Lupenko, O. Khodakivs'ka [Lupenko & Khodakivs'ka, 2016; Lupenko & Feshchenko, 2014; Khodakivs'ka 2015], V. Messel-Veselyak, M. Fedorov [Messel-Veselyak & Fedoro,v 2015], O. Mohylnyi [Khodakivs'ka & Mohyl'nyy, 2017] and others. Formation of approaches for ensuring social and economic development of rural areas, especially in terms of decentralization of power, have been substantiated in works of M. Malik [Malik & Zaburanna, 2017], L. Zaburanna, O. Korniychuk [Zaburanna & Korniychuk, 2017], O. Pavlov [Pavlov, 2016] and others. The problem of the institutional component in functioning of economic agents under market economy has been described in research works of O. Shpykuliak and O. Prutska [Shpykulyak & Prutska, 2016].

In the process of investigation, the necessity to single out negative impact factors upon complex development of agricultural sphere has been indicated in works of Ya. Hadzalo and Yu. Luzan. At the same time, these scholars highligh the fact that systemic contradictions not only generally impede the development of agrarian economy, but also social and economic problem-solving of population, cause the depression of rural territories [Hadzalo & Luzan, 2017].

At the same time, expediency of improvement of legislative support of land relations, from the point of view of law R. Ryabenko and O. Borodkin, indicate on the expediency

of improvement of legislative provision of land relations, since a significant number of restrictions which had been outlined in certain laws regarding the ownership of agricultural land may cause certain complications not only for rural areas residents [Ryabenko & Borodkin, 2020].

Scientific and practical approaches for support of territorial social-economic development have been studied by foreign scholars, namely I. Caceres [Caceres, 2014], A. Pike [Pike, 2016], E. Uyarra [Uyarra E., 2017], M. Dokic [Dokic, 2019], M. Grillitsch [Grillitsch, 2020]. Underdeveloped regions, their economic growth and institutional changes have been studied by A. Rodríguez-Pose [Rodríguez-Pose, 2020], J. Ferraz [Ferraz, 2019], G. D'Souza [D'Souza, 2019], Y. Li [Li, 2019]. Research works carried out by E. Loizou are considered to be especially significant in regards to the investigation of financing sources of development of rural area territories. Vector orientation of research works under discussion focuses on formation and implementation of state policy to support the effective functioning of agriculture, the necessity of its subsidies, which is urgent for Ukraine's economy in general, and ensuring the prospects of local territorial development, in particular in the works of D'Souza and Gebremedhin [2019]. Moreover, G. Káposzta emphasizes the existence of a significant level gap in development between urban and rural areas, as well as critical points and ways of their reduction by means of endogenous potential and own capacity [Káposzta, 2020]. The vector of financing of equally importance for support of territorial development has been recently studied by K. Kim [Kim, 2019], G. Li [Li, 2019], S. Griffith-Jones [Griffith-Jones, 2020], A. Simonovska [Simonovska, 2019], P. Capello [Capello, 2019].

The study confirms the significant scientific achievements of domestic and foreign works of economists and legal scholars. At the same time, issues of institutional and financial nature aimed at the development of rural areas, as well as some aspects related to the intensification of convergence and integration of rural border areas, taking into account the European experience in rural development.

Institutional support for the development of rural areas

Nowadays, a wide range of normative, regulatory and legislative documents has appeared, regulating the legal basis for formation an efficient system, which would contribute to regional development and extended reproduction of rural areas. Among all the documents

mentioned above, the Law of Ukraine titled “About protection of land” is of a special significance, since it outlines the powers of state bodies and local authorities towards protection, control, efficiency support and success of rational and sparing preservation of land resources of the country and its regions, as well as the formation of preventive measures to reduce the negative anthropogenic impact on their reproduction.

Joint interests of state authorities, in particular of central and local levels (local executive bodies and local government), in the process of implementation of social and economic development, has been grounded in the Law of Ukraine “About stimulation of development of regions” [The law of Ukraine “About the stimulation of the development of regions”, 2012]. This law determines the priorities of formation and provision of comfortable living environment and life of local residents within a joint territorial economic system. Furthermore, a special emphasis is placed upon the development of favorable investment circle; the maximum approach of the services rendered by state bodies and local government bodies to consumers of these services; concentration on competitive basis of means of the Government budget of Ukraine, local budgets, and also other resources for the purpose of achievement of their most effective use for the purposes of regional development, cooperation and the cross liability central and local executive bodies, local government bodies, scientific and public organizations and other subjects.

The system of regulative powers and responsibilities of local authorities and executive bodies of local government, basis and organization of their activity together with law status have been determined by Article 74 of the Law of Ukraine, titled “On local self-government in Ukraine”. Hence, they are responsible to the state, territorial community, legal entities and individuals for their own activity. The Law outlines integrated approaches in the field of joined interests of different territorial communities aimed at forming associations. This enables to strengthen the success of shared problem-solving in a common local development. It is worth mentioning that, particularly, local authorities and members of territorial community are mostly aware of local problems of the area they live in. In addition to this, they are usually better informed about the possibility of overcoming them.

Basic priorities of the regional state policy in Ukraine concerning the improvement of approaches for provision of balanced development of depressive regions, including rural areas of Thranscarpathian region, have been determined in the Law of Ukraine „About fundamentals of the state regional policy” [The law of Ukraine “About the principles

of state regional policy", 2015]. This Law determines legal, economic, social, ecological, humanitarian and organizational basis of the state regional development; it discloses state approaches towards solution of problematic issues of these areas.

Formation of institutional and financial component for provision of development of rural areas has been substantiated by the concept of steady growth of rural areas of the Transcarpathian region for 2020-2027. It clearly determines main problems of imbalances in ensuring socio-economic and ecological rural development. We suppose that the following two basic problems should be singled out among those which are directly connected with the current research [The concept of sustainable development of rural areas in the Transcarpathian region]:

- the absence of coherent and successive state policy aimed at integrated development of rural areas which would be based on the needs of territorial communities of village;
- the lack of state financial support for programs aimed at rural development.

This should also be complemented with the low level of financial provision of village due to imperfection of tax and budget systems, unclear practice of registration of agricultural producers beyond the place of economic activity.

As it has been stated in the concept, its predominant purpose lies in formation of organizational, legislative and financial preconditions for development of rural areas. From this respect, implementation of outlined basic approaches of the Concept will contribute to a comprehensive solution of current problems in rural development, since the emphasis is not only placed on the process of expanded renewal of agricultural field, but also on support of welfare of rural residents and increase of the level of life comfort. In the context of conceptual issues, it is extremely important to increase the level of innovation and business of rural citizens, especially in regards to the youth. At the same time, it is important to intensify the involvement of rural territorial communities in expanding the range of local projects in socio-economic and ecological development, which will simultaneously increase the efficiency of functioning of local authorities in solving problems of the contemporary countryside.

The importance of development of legislative support at the national level has been outlined in the project of Regional Strategy of Development of the Transcarpathian region for 2021-2027 [Regional development strategy of the Transcarpathian region, pp. 39, 70-73]. Such a need has been justified by the importance of practical realization of state finantial

projects and involving of investigation costs directed on the providing of development of rural territories. The strategy under consideration outlines the factors of influence through the conducted SWOT-analysis, and its components, which help or depress regional development, have been substantiated. Touching upon the territories of the rural areas, a rapid development of agricultural branches typical for the region has been determined; together with high business activity and labor mobility of people, which stems from the absence of language barriers with bordering neighbors. All the factors mentioned above are especially relevant in the period of realization of opportunities to join European natural and geographical areas; cultural and traditional diversity; positive ecological image of the region as a whole and natural, valuable territories, rural areas in particular. It is concerned with the expediency of development of a state system for attracting the unemployed in rural areas and distant mountain sub-regions using up-to-date information technologies. This idea is extremely urgent in the time of the quarantine caused by COVID-19.

The necessity to improve the legal basis to stimulate innovation and business activity of subjects of small-sized and middle-sized business, increasing the level of their adaptability to market conditions and ability to act in a crisis has been intensified. Moreover, the development of institutions of scientific, technical and technological support for innovative economy (including rural) is especially urgent. Since, as it has already been noted, the region is of unique development opportunities due to its border location, there is a need to intensify and facilitate the entry to financial and resource opportunities for multifaceted, goal-oriented programs and funds of international technical assistance, predominantly aimed at regional development.

Significant strengthening is also required to spur cooperation through initiatives of the EU, aimed at development of scientific and innovative sphere and rural territorial systems. This cooperation provides unique possibilities to strengthen the ties with scientists and innovators from both the EU and beyond in order to achieve common competitive advantages and implement the latest technologies into productive and economic activity of economic entities at different levels of development of territorial systems [Hazuda, Hotra & Hazuda, 2016, p. 21].

We believe that it is worth to emphasize the necessity to form an effective state policy for provision of regional development in the idea of strengthening of decentralization

processes, giving more powers and independence regarding problematic items of location development to territorial communities (joint territorial communities).

From the point of view of its perspectives, the Regional Strategy determines that a steady growth of rural (mountainous) areas under systemic reforms requires the following [Regional development strategy of the Transcarpathian region, p. 92]:

- shifting the vector away from sectoral development to spatial one as a determining feature and a leading way to alter mono-sectoral structure of rural economy into multifunctional development of rural areas, ensuring productive employment and expanding income sources of rural citizens within market transformations;
- implementation of instruments of socio-economic and managerial character aimed at achievement of a qualitatively new level of rural development that is able to provide a comprehensive solution for economic, social and ecological tasks; effective realization of social, nature, resource and cross-border potential of rural territorial communities for raising life standards of rural people.

It must be noted that those prospects, which had been determined until 2027, cover fundamental components for balanced socio-economic and ecological development of rural areas and their management. Adherence of these regulations of development increases the image of rural areas, provides their economic growth, gives an impetus to form comfortable living conditions. After all, the considered postulates will regulate decisions made by residents of rural areas towards the place of their living.

Investing and financial aspects of development of rural areas

The study of analytical and problem aspect of development of rural areas made it possible to reveal essential advantage (62.8 %) of number of rural citizens in the region dated January 1, 2020 [Statistical yearbook of Transcarpathia, 2019, p. 33]. Furthermore, there is a significant share of the economy of population in agricultural products as sector of plant farming and cattle farming (Tab. 1).

Table 1. Agricultural products in all categories of economy of the Transcarpathian region for the period 2010-2019

(in fixed prices of the year 2016 p; mln. hrn)

Indicators	2010	2015	2017	2018	2019
All categories economy					
Agricultural products	7,863.2	8,369.0	8,214.3	8,781.1	8,858.2
products of plant farming	3,875.5	4,551.3	4,527.2	4,768.9	4,480.8
products of cattle farming	3,987.7	3,817.7	3,687.1	4,012.2	4,377.4
Enterprises					
Agricultural products	354.0	802.6	861.6	983.0	838.9
products of plant farming	233.5	678.7	761.0	910.7	753.8
products of cattle farming	120.5	123.9	100.6	72.3	85.1
Economy of population					
Agricultural products	7,509.2	7,566.4	7,352.7	7,798.1	8,019.3
products of plant farming	3,642.0	3,872.6	3,766.2	3,858.2	3,727.0
products of cattle farming	3,867.2	3,693.8	3,586.5	3,939.9	4,292.3
Economy of population, % to all categories of economy					
Agricultural products	95.5	90.4	89.5	88.8	90.5
products of plant farming	94.0	85.1	83.2	80.9	83.2
products of cattle farming	97.0	96.8	97.3	98.2	98.1

Source: [Statistical yearbook of Transcarpathia, 2019, p. 272].

An indicated share of economy of population (Tab. 1) during the period under analysis (years 2010-2019) ranges from 95.5 % in 2010, being the highest, down to 88.8 % in 2018, with the lowest indicator towards all categories of economy.

Taking into consideration the sectors of economy, the highest share of economy of population was observed in 2010 (94.0 %) for products of plant farming, the lowest was in 2018 (80.9 %,), and in the sector of cattle farming, 98.2 % (2018) and 96.8 %, respectively (2015). It should be noted that despite a wide range of economies of population, there has been a slight, though positive, tendency for it to increase during the analyzed period. Thus, in 2019, compared with 2010, household manufacturing of agricultural products grew by 6.7%.

However, the development of rural areas is not limited by the development of the agrarian sphere. Needless to mention, the concerned sector plays a significant role in ensuring balance of investigated territories. Thus, a complex approach should be emphasized, since it includes essential financial support of the state, together with the solutions to problems concerning rural areas' development. In accordance with statistics, we analyze the amount of capital investments during the period 2000-2018, coming from the state and local budgets (Tab. 2).

Table 2. Capital investment by sources of funding aimed at development of Transcarpathian region

Indicators	2010	2015	2017	2018	2019
Total, ml.hrn[12]	2,205.4	3,778.4	5,623.7	7,500.6	9,330.3
%[13].	*100.0*	*100.0*	*100.0*	*100.0*	100.0
Including:					
Funds from state budget,					
mln.hrn	141.0	119.4	166.0	339.5	399.5
%	*6.4*	*3.2*	*3.0*	*4.5*	*4.3*
Funds from local budget,					
mln.hrn	189.2	413.3	661.6	872.1	1,026.0
%	*8.6*	*10.9*	*11.8*	*11.6*	*11.0*
Own funds of enterprises and organizations,					
mln.hrn	703.8	1,566.1	2,670.8	3,469.7	3,232.2
%	*31.9*	*41.4*	*47.5*	*46.3*	*34.6*
Bank credits and other loans,					
mln.hrn	239.3	51.1	112.8	206.9	98.9
%	*10.8*	*1.4*	*2.0*	*2.8*	*1.1*
Funds of non-resident investors,					
mln.hrn	107.5	25.4	27.1	7.7	2.1
%	*4.9*	*0.7*	*0.4*	*0.1*	*0.0*
Population funds for housing,					
mln.hrn	679.8	1,308.5	1,607.0	2,224.3	1,801.6
%	*30.8*	*34.6*	*28.6*	*29.6*	*19.3*
Other sources of funding,					
mln.hrn	144.8	294.6	378.4	380.4	2,770.0
%	*6.6*	*7.8*	*6.7*	*5.1*	*29.7*

Source: own study, based on Statistical yearbook of Transcarpathia, 2019, p. 319

According to the sources of financing, capital investments (Tab. 2) into regional economy, including economy of rural areas, are rather that since the amount of funding from state budget during 2010-2019 indicates a declining trend – their share in 2010 was 6.4 % of the total amount, and in 2019 – 4.3 %. Concerning the funds from local budgets, the tendency is quite the opposite. If in 2010 the share of funds was 8.6 %, in 2019 it increased to 11.0 %. In the section of sources of funding the largest share of own funds of enterprises and organizations, it ranges from 31.9 % (2010) up to 47.5 % (2017) during the analyzed period. The analyzed share decreased slightly in 2019 and was 34.6 %, which was 12.9 p.p. (percentage points) less compared to 2017. The share of capital investments from „public funds for housing" was relatively low in 2019 (19.3 %), in comparison with 2010 (30.8 %). A

[12] In actual prices

[13] Interest to the total

negative tendency can be seen according to the indicator „Funds of non-resident investors". This indicator in 2010 was 4.9 %, and in 2019 it was classified as a phenomenon that has occurred, but in dimensions smaller than those that can be expressed in the table, that is, an indicator close to zero. We consider such tendency to be useful for illustration of non-stable economic growth in terms of regional development and increasing distrust in the authorities to guarantee investments.

It appears to be extremely important to consider current challenges towards recent needs of people, predominantly the youth, for transport mobility. This mobility is supposed to expand the possibilities, but not to reduce the willingness of the youth to live in rural areas. It is particularly the quality and the length of paved roads that directly affect the choice for residence. We believe that a leading role in this choice is played the infrastructure of the area. However, this field requires significant investments.

The experience of foreign countries testifies to the increased attention to the development of rural areas. Thus, according to information data of the USDA Rural Development, for a period of ten years (2007-2017), 25 billion dollars from US investments was allocated to the infrastructure of rural development [U.S. map featuring program funding and success stories for fiscal years 2007-2017]. Over the same period, the EU information statistics show a significant amount of investment funds (80 billion euros) directed to the development of rural areas of the newly-joint member states of the union [General and regional statistics].

The positive benefit of a foreign experience lies in the process of formation and development of infrastructural basis where investments come from both - state or private structures and local executive bodies, sharing common interests not only of these structures, but also of local communities. The study of such an approach can be realized through the experience of China, where over the past five years, within the development of the country, and in accordance with the "One Belt-One Road" Initiative (2015), 45 billion dollars have been allocated in this infrastructure [The CPC Central Committee's Proposal on Formulating the Thirteenth Five-Year Plan (2016-2020)].

Taking into consideration all the information mentioned above, the emphasis should be placed upon the described problems of the development of rural areas, and those factors that hamper its expanded realization. Among all, a significant position is devoted to non-stability, and imperfection of legislative, regulatory and law support of the development

of rural areas. The fact mentioned above mainly concerns the so-called Land market of the Law of Ukraine "On Amendments of Certain Legislative Acts of Ukraine regarding Agricultural Land Commerce" which was adopted on the 31 of March, 2020 [Law of Ukraine "About amendments to legislative acts of Ukraine, concerning the circulation of agricultural lands"]. In accordance with the view of practical lawyers, there is a great „amount of restrictions, which the law imposes on the ownership of agricultural land, as well as the realization of corporate rights and property rights to real estate in Ukraine through legal formalities, is likely to be difficult for all, even for non-agricultural items." The multifunctionality of rural development also requires a clear substantiation in the legal field, within distinguishing of functions and powers of state executive bodies, local self-government bodies, and, as we suppose, rights and freedoms in solving rural problems by territorial communities. The necessity of problem-solving concerning administration causes an urgent need to improve the approaches for the formation of efficient institution of local self-government with expanded powers of its bodies and rural citizens' involvement in the managerial process. At the same time, the necessity for interaction, shared interests and personalized responsibility of mentioned subjects of management in the course of problem-solving, making appropriate decisions and their realization for maintenance of balance and stability for development of rural areas, has been confirmed.

Specific organizational matters should also be carefully investigated, since they are intensified in market conditions, especially in times of economic crisis. Investment and financial support for rural development takes a leading place among such problems, as well as effective functioning of small and medium-sized business, which would increase the level of employment of rural residents. As it has already been mentioned, a great share of economies of population in manufacturing organic products proves the advantage of such economies over state and other forms of ownership in the research area. Increased attention, as well as investment and financial resources are required for the development of rural infrastructure, including social, which increases the efficiency of the process of economic activity in the field of material production and contributes to the effectiveness of life support systems.

There is a great number of problems regarding demography, caused by permanent process of narrow reproduction of population. Alongside this fact, the level of morbidity, mortality, labor migration (both internal and external) is rising, the share of economically

active population is declining, and motivation for accumulating of intellectual potential and preserving intellectual capital in rural areas is practically disappearing.

Ecological problems are also among the better-known. Their characteristic permanence and rapid accumulation prevent efficient problem-solving, which largely depends upon the human factor. Only understanding of the urgency and complexity of overcoming them increases ecological level of agricultural production in rural areas.

At the same time, taking into consideration the uniqueness of territorial location of the Transcarpathian region, especially the border with four member states of the EU (Poland, Hungary, Romania, Slovak Republic), it is vital to study the preconditions for expanded growth of cross-border and border infrastructure in rural areas, with the following prospects of development:

- transport logistics as a significant component for infrastructure support, where the functionality of the logistics sector aims to optimize logistics operations through vehicles, in the process of distribution of material flow, starting from the supplier and ending with the final consumer;
- the sphere of economic development of territorial and spatial systems, where permanent process of social regeneration takes place, causing all the phases and aspects of social reproduction, particularly the reproduction of material goods, labor sources and manufacturing relations. The process under consideration is closely connected with economic growth that precedes this development, with further prospects of economic growth of a region and the whole country;
- the sphere of recreation and tourism industry, where interdependence and inter subordination, along with used recreation and tourist resources (natural and historical-cultural), play an important role in ensuring expanded reproduction of the territorial economic system, and rural areas in particular. At the same time, tourism industry should be studied through the lens of combination of functioning business subjects who form tourism product (goods and services) with typical material and non-typical parts, providing consumer's recreational and tourism needs, as a form of recreational adaptation and infrastructural arrangement in territorial and spatial environment;
- thesocio-cultural sphere, which is mutually conditioned by the combination of spiritual, intellectual, cultural and social aspects of human development, as well

as support of health care and formation of qualitative and affordable health care for population of the country and its regions.

Conclusions

Summing up the information mentioned above, there is a great number of subject matters for development of rural areas that have been caused by legislative, regulatory, organizational, administrative, normative, demographic, ecological and other aspects of expanded reproduction of investigated territories. A wide range of mentioned problematic issues should be solved in a comprehensive manner, largely by the state, through regulations and means of investing financial flows and investment resources of national and foreign investors.

The current research gives ground to take into consideration that the basic direction for the development of infrastructure of rural areas should be the leveling of the disparity between urban and rural areas with a clear increase in the level of welfare, quality, attractiveness and the formation of a comfortable living conditions for rural residents. State and local government support, including not only institutional, but mainly financial and business environment, will be updated with a view to increase employment and create a motivating factor for rural population with further prospects for rural development in general. In this context, the effectiveness and efficiency of state policy aimed at ensuring territorial / spatial development within rural areas, taking into account decentralization approaches and strengthening the role of local communities in addressing the issues of creating a comfortable life for rural residents, has been intensified. At the same time, the development of regional program of economic growth is rather urgent, within outlining the conceptual basis of interdependence and harmonious combination of socio-economic and environmental components. Moreover, we consider as positive the motivation of people to live in rural areas and this formation should be in the sphere of responsibility of all government agencies of the region and the country as a whole.

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Assessment of the state financial security level

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Abstract: The article describes the methodical approaches to assessment of the state financial security level. Ukraine has been taken as an example. A set of indicators that determine the level of financial security of Ukraine has been analyzed. For the purpose of optimizing the list of indicators that are taken into account while determining the integrated financial security level of Ukraine, the elements of correlation analysis have been used. The development of correlation matrix made it possible to identify the level of interrelationship between financial security indicators. A lot of indicators, proposed by the Methodical guidelines on the calculation of the level of economic security of the state, are closely correlated with each other, enhancingthe overall effect of their dynamics on the integrated level of financial security. The need to neutralize them has been established. All things considered, suggestions for improvement the Methodical guidelines on the calculation of the level of economic security of the state, based on the optimization of the indicator numbers and taking into consideration the close correlations between them, have been proposed. Such indicators as: level of capitalization of listed companies to GDP; gross international reserves of Ukraine; the share of loans in foreign currency; ratio of liquid assets to short-term liabilities; level of GDP redistribution through consolidated budget; the difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU) have been recommended for removal from the method of Ukraine's financial security assessment. The changes of methodical approaches to the diagnosis of the state financial security level will allow us to obtain a relevant information base for the analysis of the state financial security and make appropriate decisions concerning neutralization of threats and strengthening of security.

Keywords: assessment, financial security, security level, indicators, the correlation matrix, correlations.

JEL: E60, H56

Introduction

In modern economic realities, one of the fundamental factors of a sovereign state's independence is the state financial security as a set of measures for fiscal and monetary policies in order to achieve stability of the financial system and create favorable investment

climate. Market conditions as well as a complex system of economic relations, the unsatisfactory state of the domestic financial sector and the significant changes that have taken place in recent years in Ukraine have created new threats to the domestic economy. Consequently, monitoring of the state domestic financial sector due to the instability of the internal and external environments is becoming increasingly difficult. Financial security, as an integral part of economic security, has a significant impact on the level of economic growth in a country. The key to financial security is the transparency of the processes occurring in public finances and banking sector [Józef Antoni Haber, 2018].

In order to achieve the highest level of financial security and ensure its strengthening, the state should implement an appropriate mechanism. A key aspect is the constant monitoring of the financial security level dynamics. Significant changes that have occurred in recent years have also created new threats to the domestic economy, necessitating the diagnosis of Ukraine's financial security [Mihus, 2018]. We should verify individual data to determine financial security by establishing correlations between them. There are still many questions regarding the assessment of the state financial security level.

The purpose of this research is to identify the level of interrelationship between financial security indicators and to improve the Methodical guidelines on the calculation of the level of economic security of the state based on the optimization of the indicator numbers, taking into account the close correlations between them.

Literature review

A significant number of articles and other research are devoted to the exploration of state financial security, its level and assessment. Scientists have been thoroughly working out the structure of financial security, its indicators, factors, threats to financial security, and the ways of their neutralization. The works of scientists such as Baldwin (1997), Yong (2009), Nesadurai (2005), Nanto (2011), Ronis (2011), Wang (2004) are of a fundamental nature. The authors consider the structure and concepts of financial security support, possible threats and directions for their neutralization, basing on the example of the countries all over the world. Studies of the relevant literature indicate the difficulties that arise in identifying the concept of financial security.

A country's financial security is a multifaceted phenomenon: to start with, it is a component of economic security, and, secondly, it is a subsystem of national security. At the same time, financial security is a complicated multi-level system, which is formed by several subsystems, each of which has its own structure and logic of development [Józef Antoni Haber, 2018; Savytska, 2012]. It is the state of financial and credit sphere, characterized by balance and quality of the system of financial interests, sufficient financial resources for all economic entities and the population as a whole, that ensures the effective functioning of the national economic system and social development [Yermoshenko, 2001]; protection of the state's interests in the financial sphere, or the state of the budget, tax and monetary systems that guarantees the state's ability to rationally use financial resources [Sukhorukov, 2004]; implementation of a targeted set of measures on fiscal and monetary policies in order to achieve stability of the financial system and create a favorable investment climate [Kulpinskyy, 2000].

According to Methodical guidelines on the calculation of the level of economic security of Ukraine, approved by the Order of the Ministry of Economic Development and Trade of Ukraine dated October 29, 2013, No. 1277, financial security is the state of the country's financial system, which creates the necessary financial conditions for stable socio-economic development, ensures its resilience to financial shocks and imbalances, creates conditions for maintaining the integrity and unity of the country's financial system. In the article by Józef, Haber, Bukhtiarova, Chorna, Iastremska & Bolga (2018), the level of financial security of the country based on regression analysis of impact factors is forecasted. Based on the calculation of the arithmetic mean of absolute deviations of independent variables, the estimated value of Ukraine's financial security level is calculated. Proposals for improving the Methodical guidelines on the calculation of the level of economic security of Ukraine, concerning the choice of indicators for assessing financial security, are made. We also believe that indicators used to determine financial security should be revised. With this, we propose to establish correlations between relevant indicators.

The study by Shkolnyk, Kozmenko, Polach & Wolanin (2020) aimed to assess the level of financial security. Its structural analysis is carried out, and the factors influencing it are identified, using the case of Poland and Ukraine. The countries' financial security is analyzed by four indicator groups. Using Harrington's Desirability Function, an integrated financial security indicator was created for each country. We fully share the position, formed in this

study, that the set of indicators is wide, therefore it is not possible to use them as a standard for all countries, since the structure and level of development of financial systems differ. Thus, it's necessary to determine their list individually within countries or regions.

Koilo, Ryabushka, Kubakh & Halik (2020) examined the financial security characteristics and analyzed an integral indicator, based on a taxonomic approach. The research of Khalatur, Pavlova & Zhylenko (2018) aimed at analyzing the current state of financial security indicators of the national economy of Ukraine and defined the directions of increasing financial security of Ukraine in the context of transnationalization and national interests on the basis of studying and evaluating the practical bases. A correlation analysis was conducted to determine the dependence of the money supply on other indicators of the national economy in Ukraine. Unlike regression analysis, this is the only indicator that calculates this method of statistical research. The correlation coefficient varies from +1 to –1. Pochenchuk G. (2014) proves the point of view that financial security of the state firstly depends on governance efficiency. We support this point of view, but we also suppose that the transparency of processes taking place in public finances, the banking and non-banking sector, underlie the level of financial security. Basing on the analysis of the key balance of payments accounts and several proposed financial security indicators, a ranking of the analyzed economies is suggested by Siemiątkowski. It is based on the Financial Security Index, which uses linear alignment methods (Siemiątkowski, 2017).

Ensuring financial security at all levels of management is an urgent task for many countries, including Ukraine. It is impossible to solve the economic problems facing the country do not provide its financial security. This task becomes a special priority in conditions of instability, financial crisis, changing economic realities, transnationalization and deepening of global financial instability, increasing threats to all parts of the financial security of the state. The indicators of state financial security must be studied under these conditions.

Methodology of the research

There are difficulties in assessing the state financial security due to different approaches to the selection of appropriate indicators. Thus, according to the methodology proposed by the Institute of Economics of the Russian Academy of Sciences, there are used 15 indicators, which are characterized by the highest level of sensitivity. In the methodology that

has been used in Ukraine until 2013 (developed by the Ministry of Economic Development and Trade of Ukraine, dated March 02, 2007, No. 60), financial security indicators were defined according to the types of security: budget security; money market security and inflation; currency security; debt security; insurance market security; stock market security; banking security.

In modern economic realities, the assessment of the state financial security level in Ukraine is based on the Guidelines dated October 29, 2013, No. 1277. Currently, in accordance with the legal framework, financial security is formed by the following components: banking, non-banking, debt, budget, currency and monetary security. Among the main indicators of financial security of the country, scientists identify: GDP, GDP growth rate, GDP per capita, income differentiation index, unemployment rate, industrial production growth rate, import-export balance, inflation rate, natural population growth rate [Bilorys, 2002]; budget, currency, monetary, debt security, insurance market and stock market security [Savytska, 2012].

The International Monetary Fund has developed its own methodology and set of indicators to assess the financial stability of countries. Financial soundness indicators (FSIs) provide insight into the financial health and soundness of a country's financial institutions as well as corporate and household sectors. FSIs support economic and financial stability analysis. The IMF methodology operates on a number of indicators, grouped by the following: FSI Code Core; FSIs for Deposit Takers; Additional FSIs for Deposit Takers; FSIs for Other Financial Corporations; FSIs for Nonfinancial Corporations; FSIs for Households; FSIs for Market Liquidity; FSIs for Real Estate Markets [Financial Soundness Indicators and IMF, 2019]. Each component of financial security, in addition to performing the relevant functions, is an integral part of the synergetic system designed to ensure the stability of the national economy in relation to internal and external negative impacts for its effective functioning [Mihus, Akimova & Harnyk, 2018].

The list of indicators of economic security, defined by the Methodical guidelines on the calculation of the level of economic security of Ukraine, contains a large number of financial security indicators. In our opinion, the above list has some shortcomings: there is a large number of proposed indicators and there is a fairly conditional distribution of their components, which are often related; correlation between indicators in some way may distort the integrated indicator of economic security. In order to avoid certain shortcomings, we

propose to identify possible correlations between financial security indicators. For those that significantly correlate with other indicators we consider their weights to be reduced or we should exclude them altogether. This will allow a wide range of scholars and practitioners to have access to information characterizing the state of financial security of Ukraine, as well as to make appropriate decisions concerning neutralization of threats and strengthening of security.

Results

Let's analyze the closeness of the relationship between the sets of financial security indicators. The initial data for analysis are given in Table 1. The same table indicates the symbols of economic security indicators for standardization of further calculations. The research period is 2013-2019.

Table 1. Initial data for the analysis of the closeness of the mutual influence of financial security indicators of Ukraine

Indicators	Symbols	2013	2014	2015	2016	2017	2018	2019
1. Banking security								
1.1. Share of arrears on loans in the total volume of loans granted by banks to residents of Ukraine, %	x_1	12,89	18,98	28,03	13,61	22,21	25,89	26,03
1.2. The ratio of bank loans and deposits in foreign currency, %	x_2	125,15	154,21	180,96	134,50	125,88	107,77	83,5
1.3. Share of foreign capital in the authorized capital of banks, %	x_3	27,37	31,48	35,04	39,58	46,34	48,05	50,34
1.4. Ratio of long-term (over 1 year) loans and deposits, times	x_4	1,76	2,83	3,89	4,13	3,41	3,76	3,76
1.5. Return on assets, %	x_5	0,11	-3,99	-6,22	-15,55	-1,38	1,60	4,35
1.6. Ratio of liquid assets to short-term liabilities, %	x_6	89,11	86,14	92,87	92,09	98,37	93,52	94,06
1.7. The share of assets of the five largest banks in total assets of the bank's securities, %,	x_7	40,01	43,41	53,62	55,63	26,21	89,97	57,62
2. Non-banking security								
2.1 Level of insurance penetration (insurance premiums to GDP), %	x_8	1,96	1,71	1,50	1,48	1,46	0,98	1,33
2.2 Level of capitalization of listed companies to GDP	x_9	21,28	29,21	3,21	0,82	0,41	0,28	0,29
2.3 Volatility level of the PFTS index, the number of critical deviations (-10%)	x_{10}	0,00	1,00	1,00	0,00	0,00	0,00	0,00
2.4 Share of insurance premiums of the three largest insurance companies in the total amount of insurance premium receipts (except life), %	x_{11}	13,50	15,60	14,70	18,90	21,30	14,90	15,23
3. ***Debt security***								
3.1 The ratio of the state and state-guaranteed debt to GDP, %	x_{12}	39,88	70,26	79,40	80,97	71,80	60,94	52,38
3.2 The ratio of gross external debt to GDP, %	x_{13}	16,32	33,10	43,60	41,64	36,59	31,22	78,5
3.4 The average weighted yield of T-bills (government bonds) in the primary market	x_{14}	736,80	1 013,50	2374,60	762,50	564,20	454,60	568
3.5 The ratio of official international reserves to the volume of gross external debt, %	x_{15}	68,23	22,91	36,99	42,58	48,37	51,89	20,78
4. ***Budget security***								
4.1 The ratio of the deficit / surplus of the state budget to GDP, %	x_{16}	-4,45	-4,98	-2,28	-2,94	-1,60	-1,66	-2,09
4.2 Deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP	x_{17}	-0,45	-1,02	-2,62	-2,1	-0,83	-0,25	-0,67
4.3 Level of GDP redistribution through consolidated budget, %	x_{18}	30,43	29,11	32,94	32,84	34,08	33,28	31,15

4.4 The ratio of aggregate payments for servicing and repayment of state debt to the state budget revenues, %	x_{19}	32,9	47,7	38,9	33.85	28,3	20,32	47,12
5. Currency security								
5.1 The index of the change in the official rate of the national currency to the US dollar, the average for the period	x_{20}	1,00	1,41	1,96	1,16	1,04	1,02	1,02
5.2 The index of the change in the official rate of the national currency to the US dollar, the average for the period	x_{21}	-24,70	-454,18	-2,73	9,09	-8,78	-2,17	-1,85
5.3 Gross international reserves of Ukraine, months of import	x_{22}	2,70	1,00	3,20	3,70	3,60	3,40	3,80
5.4 The share of loans in foreign currency in the total amount of loans granted, %	x_{23}	33,82	46,31	55,81	49,43	43,87	42,78	36,85
5.5 Balance of sale and purchase of foreign currency by the population, billion US dollars	x_{24}	-1,16	-0,79	1,55	2,48	2,14	1,48	4,93
5.6 Dollarization of the money supply, %	x_{25}	27,24	32,16	32,17	32,87	31,90	29,25	29,49
6. Currency and monetary security								
6.1 Specific weight of cash outside banks in the total amount of money supply (M0/M3), %	x_{26}	26,16	29,57	28,44	28,51	27,51	28,46	26,73
6.2 The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	x_{27}	4,90	4,55	5,93	5,46	6,28	6,32	5,62
6.3 The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	x_{28}	16,33	5,52	-26,87	4,64	1,96	8,23	7,46
6.4 Share of consumer loans granted to households in the general structure of loans granted to residents, %	x_{29}	15,08	13,24	10,68	10,17	12,01	14,13	17,87
6.5 Share of long-term loans in the total amount of loans granted (corrected for the exchange rate difference), %	x_{30}	66,34	53,85	44,25	50,59	56,15	57,24	19,63
6.6 Total export of financial resources outside the country, billion dollars USA	x_{31}	10,50	11,90	15,60	15,10	14,30	13,87	13,52

Source: calculated by the authors on the basis of Official site of the State Statistics Service of Ukraine [https: ukrstat.gov.ua]

Table 2. Correlation matrix of financial security indicators of Ukraine

		Financial security indicators																														
		x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}	x_{31}
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Financial security indicators	x_1	1,00																														
	x_2	-0,03	1,00																													
	x_3	0,58	-0,65	1,00																												
	x_4	0,54	-0,01	0,68	1,00																											
	x_5	0,45	-0,58	0,33	-0,34	1,00																										
	x_6	0,46	-0,33	0,76	0,53	0,17	1,00																									
	x_7	0,39	-0,28	0,39	0,44	0,12	-0,02	1,00																								
	x_8	-0,67	0,39	-0,86	-0,76	-0,19	-0,56	-0,74	1,00																							
	x_9	-0,49	0,32	-0,80	-0,79	0,05	-0,87	-0,36	0,74	1,00																						
	x_{10}	0,27	0,81	-0,50	0,00	-0,22	-0,49	-0,13	0,26	0,47	1,00																					
	x_{11}	-0,12	-0,02	0,39	0,39	-0,39	0,60	-0,43	-0,15	-0,41	-0,29	1,00																				
	x_{12}	0,18	0,61	0,09	0,69	-0,73	0,19	-0,04	-0,25	-0,30	0,44	0,56	1,00																			
	x_{13}	0,52	-0,40	0,64	0,60	0,18	0,35	0,14	-0,41	-0,50	-0,06	0,07	0,09	1,00																		
	x_{14}	0,34	0,84	-0,43	0,17	-0,33	-0,16	-0,09	0,21	0,06	0,79	-0,28	0,46	0,01	1,00																	
	x_{15}	-0,43	-0,03	-0,28	-0,47	0,01	0,11	-0,03	0,20	0,00	-0,48	-0,04	-0,37	-0,75	-0,20	1,00																
	x_{16}	0,67	-0,32	0,85	0,72	0,18	0,92	0,34	-0,80	-0,95	-0,39	0,38	0,25	0,44	-0,06	0,00	1,00															
	x_{17}	-0,06	-0,74	0,26	-0,49	0,77	0,01	0,13	-0,12	0,20	-0,53	-0,16	-0,76	-0,15	-0,79	0,27	-0,04	1,00														
	x_{18}	0,36	-0,02	0,57	0,62	-0,18	0,87	0,18	-0,60	-0,86	-0,36	0,56	0,44	0,05	0,03	0,30	0,87	-0,24	1,00													
	x_{19}	0,02	0,16	-0,26	-0,07	-0,02	-0,46	-0,34	0,42	0,42	0,53	-0,23	0,02	0,52	0,31	-0,77	-0,47	-0,27	-0,70	1,00												
	x_{20}	0,37	0,87	-0,39	0,25	-0,37	-0,21	-0,05	0,13	0,10	0,88	-0,22	0,58	0,03	0,97	-0,34	-0,08	-0,80	0,00	0,36	1,00											
	x_{21}	0,17	-0,33	0,44	0,34	0,03	0,71	0,22	-0,36	-0,81	-0,64	0,13	-0,11	0,19	-0,05	0,46	0,71	-0,09	0,73	-0,53	-0,21	1,00										
	x_{22}	0,26	-0,45	0,67	0,56	0,01	0,83	0,24	-0,52	-0,93	-0,67	0,33	0,04	0,43	-0,16	0,21	0,83	-0,10	0,77	-0,43	-0,27	0,94	1,00									
	x_{23}	0,29	0,78	-0,09	0,61	-0,68	0,05	0,07	-0,18	-0,22	0,64	0,25	0,93	0,01	0,73	-0,31	0,18	-0,86	0,37	0,05	0,81	-0,09	-0,04	1,00								
	x_{24}	0,49	-0,51	0,84	0,75	0,10	0,68	0,23	-0,62	-0,82	-0,38	0,32	0,17	0,89	-0,15	-0,46	0,74	-0,12	0,46	0,11	-0,15	0,53	0,76	0,03	1,00							
	x_{25}	0,10	0,56	0,06	0,61	-0,71	0,12	-0,22	-0,11	-0,17	0,47	0,62	0,96	0,18	0,39	-0,51	0,11	-0,72	0,27	0,22	0,52	-0,26	-0,07	0,84	0,18	1,00						
	x_{26}	0,15	0,55	-0,08	0,41	-0,50	-0,30	0,24	-0,25	0,15	0,63	0,15	0,76	-0,12	0,31	-0,44	-0,13	-0,41	-0,01	0,09	0,50	-0,58	-0,47	0,74	-0,20	0,73	1,00					
	x_{27}	0,63	-0,20	0,74	0,63	0,16	0,90	0,34	-0,77	-0,88	-0,35	0,38	0,27	0,22	-0,02	0,16	0,97	-0,03	0,93	-0,63	-0,04	0,69	0,76	0,23	0,56	0,10	-0,07	1,00				
	x_{28}	-0,57	-0,71	0,05	-0,50	0,32	-0,21	0,02	0,13	0,30	-0,66	-0,02	-0,66	-0,20	-0,91	0,29	-0,32	0,80	-0,37	-0,16	-0,91	-0,12	-0,11	-0,84	-0,16	-0,57	-0,37	-0,34	1,00			
	x_{29}	0,16	-0,76	0,27	-0,34	0,84	-0,08	0,17	-0,06	0,13	-0,34	-0,48	-0,84	0,38	-0,49	-0,14	-0,05	0,74	-0,46	0,26	-0,53	-0,01	0,01	-0,84	0,21	-0,75	-0,58	-0,17	0,56	1,00		
	x_{30}	-0,54	0,34	-0,54	-0,54	-0,21	-0,25	-0,16	0,35	0,42	-0,03	0,06	-0,05	-0,99	-0,10	0,77	-0,37	0,17	0,04	-0,59	-0,11	-0,15	-0,35	-0,02	-0,83	-0,13	0,12	-0,15	0,24	-0,41	1,00	
	x_{31}	0,51	0,23	0,51	0,93	-0,45	0,62	0,24	-0,60	-0,80	0,08	0,46	0,79	0,42	0,38	-0,28	0,74	-0,66	0,77	-0,17	0,42	0,45	0,59	0,75	0,63	0,67	0,36	0,70	-0,70	-0,57	-0,37	1,00

Source: calculated by the authors

It is well known that the value of correlation coefficients determines how closely related the empirical parameters of linear dependence are. With a positive relationship between them, the correlation coefficient $r_{y,x}$ takes values from 0 to 1. The closer $r_{y,x}$ to 1, the closer the empirical dependence to the functional [Venetsky, Kildysheva, 1956].

Table 2 contains the results of calculations of paired correlation coefficients for all these indicators in the form of a correlation matrix. The correlation matrix *n* of random variables X_1, …, X_n is a matrix of size $n \times n$ elements of row *i* and column *j* of which $\rho(X_i; X_j)$. The adequacy of the obtained data will be checked using Fisher's test. According to the values of the coefficient of determination R^2 obtained in the model, the experimental value of *F*-statistics is calculated:

(1) $$F_{\text{эксп}} = \frac{R^2}{1 - R^2} \cdot \frac{n - m - 1}{m}.$$

which is compared with the tabular value of the Fisher distribution at a given level of significance α (usually α = 0.05 or α = 0.01). If $F_{table} < F_{exp}$, the null hypothesis is rejected, there is a coefficient in the regression equation that differs significantly from zero, and the corresponding factor affects the studied variable. The deviation of the null hypothesis indicates the adequacy of the constructed model. Otherwise, the model is considered inadequate [Kozmenko & Kuzmenko, 2014]. F_{table} for the significance level α = 0.05 and degrees of freedom 1 and 5 is 2.57. The calculated values of F statistics are given in Table. 3. The fill highlights cases when $F_{table} < F_{exp}$, i.e., cases of statistically significant correlation coefficients.

Based on the results of checking the correlation coefficients for significance and removing statistically insignificant coefficients from the correlation matrix, the “cleaned” correlation matrix reflects the “true” statistically significant relationships between the variables (Table 4).

Table 3. The value of the F-criterion

		Financial security indicators																														
		x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}	x_{31}
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Financial security indicators	x_1	x																														
	x_2	-0,06	x																													
	x_3	1,58	-1,93	x																												
	x_4	1,42	-0,03	2,06	x																											
	x_5	1,13	-1,58	0,78	-0,81	x																										
	x_6	1,17	-0,78	2,64	1,38	0,38	x																									
	x_7	0,94	-0,65	0,96	1,11	0,27	-0,04	x																								
	x_8	-2,00	0,95	-3,70	-2,62	-0,43	-1,50	-2,49	x																							
	x_9	-1,25	0,76	-2,96	-2,90	0,10	-3,88	-0,86	2,45	x																						
	x_{10}	0,63	3,12	-1,30	-0,01	-0,50	-1,27	-0,30	0,61	1,18	x																					
	x_{11}	-0,28	-0,06	0,96	0,94	-0,93	1,68	-1,07	-0,35	-1,00	-0,67	x																				
	x_{12}	0,42	1,70	0,21	2,15	-2,42	0,44	-0,08	-0,57	-0,71	1,11	1,50	x																			
	x_{13}	1,36	-0,98	1,85	1,67	0,42	0,84	0,32	-1,00	-1,29	-0,14	0,17	0,21	x																		
	x_{14}	0,80	3,43	-1,08	0,38	-0,79	-0,36	-0,21	0,48	0,13	2,89	-0,64	1,16	0,01	x																	
	x_{15}	-1,07	-0,07	-0,64	-1,18	0,03	0,26	-0,07	0,47	0,00	-1,23	-0,08	-0,89	-2,53	-0,46	x																
	x_{16}	2,00	-0,76	3,60	2,29	0,41	5,29	0,82	-2,99	-6,64	-0,95	0,93	0,57	1,11	-0,14	-0,01	x															
	x_{17}	-0,14	-2,45	0,59	-1,25	2,73	0,02	0,28	-0,27	0,46	-1,39	-0,36	-2,65	-0,33	-2,92	0,61	-0,10	x														
	x_{18}	0,86	-0,05	1,56	1,78	-0,41	3,87	0,41	-1,67	-3,84	-0,87	1,52	1,10	0,12	0,07	0,71	3,95	-0,54	x													
	x_{19}	0,05	0,37	-0,59	-0,16	-0,04	-1,17	-0,81	1,04	1,04	1,41	-0,54	0,05	1,37	0,74	-2,70	-1,20	-0,62	-2,16	x												
	x_{20}	0,90	3,89	-0,95	0,57	-0,90	-0,48	-0,11	0,30	0,22	4,16	-0,49	1,59	0,06	9,67	-0,81	-0,19	-2,95	-0,01	0,86	x											
	x_{21}	0,38	-0,79	1,10	0,81	0,08	2,28	0,51	-0,85	-3,05	-1,86	0,30	-0,24	0,44	-0,12	1,16	2,28	-0,20	2,38	-1,41	-0,48	x										
	x_{22}	0,60	-1,12	2,03	1,51	0,02	3,27	0,55	-1,37	-5,71	-2,00	0,78	0,09	1,05	-0,37	0,48	3,37	-0,22	2,74	-1,08	-0,63	6,30	x									
	x_{23}	0,67	2,80	-0,21	1,71	-2,09	0,12	0,15	-0,41	-0,49	1,85	0,58	5,61	0,03	2,37	-0,72	0,40	-3,77	0,89	0,11	3,13	-0,21	-0,09	x								
	x_{24}	1,27	-1,32	3,48	2,57	0,21	2,05	0,54	-1,75	-3,19	-0,91	0,77	0,40	4,39	-0,34	-1,16	2,50	-0,27	1,15	0,24	-0,35	1,39	2,61	0,08	x							
	x_{25}	0,23	1,52	0,13	1,70	-2,24	0,27	-0,50	-0,25	-0,39	1,20	1,75	7,90	0,41	0,95	-1,32	0,26	-2,32	0,64	0,51	1,38	-0,61	-0,17	3,49	0,42	x						
	x_{26}	0,33	1,49	-0,19	1,01	-1,29	-0,71	0,56	-0,58	0,34	1,84	0,34	2,58	-0,27	0,73	-1,10	-0,29	-1,00	-0,03	0,21	1,30	-1,61	-1,18	2,49	-0,45	2,38	x					
	x_{27}	1,83	-0,46	2,50	1,81	0,35	4,51	0,82	-2,72	-4,23	-0,83	0,91	0,62	0,50	-0,04	0,37	8,81	-0,06	5,45	-1,83	-0,10	2,15	2,62	0,52	1,51	0,22	-0,15	x				
	x_{28}	-1,57	-2,27	0,12	-1,28	0,74	-0,49	0,04	0,28	0,69	-1,94	-0,04	-1,96	-0,45	-4,82	0,69	-0,76	3,03	-0,89	-0,36	-4,89	-0,27	-0,24	-3,44	-0,35	-1,54	-0,90	-0,82	x			
	x_{29}	0,37	-2,62	0,62	-0,82	3,51	-0,18	0,38	-0,13	0,30	-0,82	-1,23	-3,49	0,92	-1,24	-0,32	-0,11	2,49	-1,16	0,59	-1,39	-0,03	0,01	-3,41	0,49	-2,56	-1,58	-0,38	1,50	x		
	x_{30}	-1,43	0,81	-1,45	-1,44	-0,48	-0,58	-0,37	0,83	1,04	-0,07	0,14	-0,11	-14,46	-0,23	2,66	-0,89	0,40	0,09	-1,64	-0,26	-0,34	-0,85	-0,05	-3,31	-0,30	0,27	-0,33	0,56	-1,01	x	
	x_{31}	1,31	0,53	1,34	5,56	-1,12	1,75	0,56	-1,69	-3,01	0,18	1,17	2,84	1,04	0,93	-0,64	2,43	-1,98	2,70	-0,39	1,03	1,12	1,65	2,51	1,80	2,02	0,86	2,20	-2,18	-1,55	-0,89	x

Source: calculated by the authors

Table 4. Purified correlation matrix of indicators of financial security

		Financial security indicators																																Total horizontally
		x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}	x_{31}	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33		34
Financial security indicators	x_1																																	0
	x_2		x																															0
	x_3			x																														0
	x_4				x																													0
	x_5					x																												0
	x_6			0,76			x																											1
	x_7							x																										0
	x_8			-0,86	-0,76				x																									2
	x_9			-0,80	-0,79		-0,87			x																									3
	x_{10}		0,81								x																								1
	x_{11}											x																							0
	x_{12}												x																						0
	x_{13}													x																					0
	x_{14}		0,84								0,79				x																				2
	x_{15}															x																			0
	x_{16}			0,85			0,92		-0,80	-0,95							x																			4
	x_{17}					0,77							-0,76		-0,79			x																		3
	x_{18}						0,87			-0,86							0,87		x																	3
	x_{19}															-0,77				x															1
	x_{20}		0,87								0,88				0,97			-0,80			x														4
	x_{21}									-0,81												x													1
	x_{22}						0,83			-0,93							0,83		0,77			0,94	x												5
	x_{23}		0,78										0,93					-0,86			0,81			x											4
	x_{24}			0,84						-0,82				0,89									0,76		x										4
	x_{25}												0,96											0,84		x									2
	x_{26}												0,76																						1
	x_{27}						0,90		-0,77	-0,88							0,97		0,93				0,76					x							6
	x_{28}														-0,91			0,80			-0,91			-0,84					x						4
	x_{29}					0,84							-0,84											-0,84						x					3
	x_{30}													-0,99		0,77									-0,83						x				3
	x_{31}				0,93					-0,80			0,79						0,77													x			4
Total vertical			4	5	3	2	5	0	2	7	2	0	6	2	3	2	3	3	3	0	2	1	2	3	1	0	0	0	0	0	0	0		
The number of factors with which it is established	close relationship (r_{xy} >0.75)	0	4	5	3	2	6	0	4	10	3	0	6	2	5	2	7	6	6	1	6	2	7	7	5	2	1	6	4	3	3	4		
	very close connection (r_{xy} >0.9)	0	0	0	1	0	1	0	0	2	0		2	1	2	0	3		1		2	1	2	1	0	1	0	2	2	0	1	1		

Source: calculated by the authors

The results of the calculations of the correlation coefficients indicate that there is a relationship between many indicators of financial security of different densities. The list of indicators, ranked by the number of factors with a very close relationship, is given in Table 5.

Table 5. Ranking of financial security indicators by the number of factors with which there is a very close relationship

Financial security indicators	The number of factors with which there is a very close relationship (r_{xy} >0.9)
The ratio of the deficit / surplus of the state budget to GDP, %	3
The ratio of the state and state-guaranteed debt to GDP, %	2
Level of capitalization of listed companies to GDP	2
The average weighted yield of T-bills (government bonds) in the primary market	2
The index of the change in the official rate of the national currency to the US dollar, the average for the period	2
Gross international reserves of Ukraine, months of import	2
The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	2
The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	2
The ratio of long-term (over 1 year) loans and deposits, times	1
The ratio of liquid assets to short-term liabilities, %	1
The ratio of gross external debt to GDP, %	1
Level of GDP redistribution through consolidated budget, %	1
The index of the change in the official rate of the national currency to the US dollar, the average for the period	1
The share of loans in foreign currency in the total amount of loans granted, %	1
Dollarization of the money supply, %	1
Share of long-term loans in the total amount of loans granted (corrected for the exchange rate difference), %	1
Total export of financial resources outside the country, billion dollars USA	1

Source: defined by the authors.

As we see, the largest number of financial security of the presented studied (3) is very closely correlated with the indicator «The ratio of the deficit / surplus of the state budget to GDP, %»; two indicators are closely correlated with the indicator «The ratio of the state and state-guaranteed debt to GDP, %» and others. The list of indicators presenting very close relationships is illustrated in Table 6.

Table 6. List of indicators with a very close pair correlation

Financial security indicators	An indicator of very close pair correlation (r_{xy} >0.9)	The type of connection
The ratio of the deficit / surplus of the state budget to GDP, %	Ratio of liquid assets to short-term liabilities, %	direct
	Level of capitalization of listed companies to GDP	reverse
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	direct
The ratio of the state and state-guaranteed debt to GDP, %	The share of loans in foreign currency in the total amount of loans granted, %	direct
	Dollarization of the money supply, %	direct
Level of capitalization of listed companies to GDP	The ratio of the deficit / surplus of the state budget to GDP, %	reverse
	Gross international reserves of Ukraine, months of import	reverse
The average weighted yield of T-bills (government bonds) in the primary market	The index of the change in the official rate of the national currency to the US dollar, the average for the period	direct
	The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	reverse
The index of the change in the official rate of the national currency to the US dollar, the average for the period	The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	reverse
	The average weighted yield of T-bills (government bonds) in the primary market	direct
Gross international reserves of Ukraine, months of import	The index of the change in the official rate of the national currency to the US dollar, the average for the period	direct
	Level of capitalization of listed companies to GDP	reverse
The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	The ratio of the deficit / surplus of the state budget to GDP, %	direct
	Level of GDP redistribution through consolidated budget, %	direct
The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	The index of the change in the official rate of the national currency to the US dollar, the average for the period	reverse
	The average weighted yield of T-bills (government bonds) in the primary market	reverse

Source: suggested by the authors.

An analysis of financial security indicators that are very closely related to other indicators allows us to draw the following conclusions. The indicator «The ratio of the deficit / surplus of the state budget to GDP, %» is closely correlated with the ratio of liquid assets and short-term liabilities (direct relationship), the level of capitalization of listed companies to GDP (reverse relationship), the difference between the interest rates on loans granted by deposit-taking corporations to interest rates on deposits attracted by deposit-taking institutions (except NBU) (direct relationship). The ratio of the state and state-guaranteed debt to GDP is closely related to the share of loans in foreign currency in the total amount of loans granted and the dollarization of the money supply. The level of capitalization of listed companies to GDP is closely related to the indicators «The ratio of the deficit / surplus of the state budget to GDP» and «Gross international reserves of Ukraine, months of import». Table 7 contains information about the indicators that have the largest number of factors with which a close relationship is established (r_{xy}> 0.77).

Table 7. The list of indicators with a close pair of correlations

Financial security indicators	An indicator of the close pair correlation (r_{xy} >0.8)	The type of connection
Level of capitalization of listed companies to GDP	The ratio of the deficit / surplus of the state budget to GDP, %	reverse
	Level of GDP redistribution through consolidated budget, %	reverse
	The index of the change in the official rate of the national currency to the US dollar, the average for the period	reverse
	Gross international reserves of Ukraine, months of import	reverse
	Balance of sale and purchase of foreign currency by the population, billion US dollars	reverse
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	reverse
	Total export of financial resources outside the country, billion dollars USA	reverse
	Share of foreign capital in the authorized capital of banks, %	reverse
	Ratio of long-term (over 1 year) loans and deposits, times	reverse
	Ratio of liquid assets to short-term liabilities, %	reverse
The ratio of the deficit / surplus of the state budget to GDP, %	Level of GDP redistribution through consolidated budget, %	direct
	Gross international reserves of Ukraine, months of import	direct
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	direct
	Level of capitalization of listed companies to GDP	reverse
	Level of insurance penetration (insurance premiums to GDP), %	reverse
	Ratio of liquid assets to short-term liabilities, %	direct
	Share of foreign capital in the authorized capital of banks, %	direct

Gross international reserves of Ukraine, months of import	Balance of sale and purchase of foreign currency by the population, billion US dollars	direct
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	direct
	The index of the change in the official rate of the national currency to the US dollar, the average for the period	direct
	Level of GDP redistribution through consolidated budget, %	direct
	The ratio of the deficit / surplus of the state budget to GDP, %	direct
	Level of capitalization of listed companies to GDP	reverse
	Ratio of liquid assets to short-term liabilities, %	direct
The share of loans in foreign currency in the total amount of loans granted, %	Dollarization of the money supply, %	direct
	The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	reverse
	Share of consumer loans granted to households in the general structure of loans granted to residents, %	reverse
	The index of the change in the official rate of the national currency to the US dollar, the average for the period	direct
	Deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP	reverse
	The ratio of the state and state-guaranteed debt to GDP, %	direct
	The ratio of bank loans and deposits in foreign currency, %	direct
Ratio of liquid assets to short-term liabilities, %	Level of capitalization of listed companies to GDP	reverse
	The ratio of the deficit / surplus of the state budget to GDP, %	direct
	Level of GDP redistribution through consolidated budget, %	direct
	Gross international reserves of Ukraine, months of import	direct
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	direct
	Share of foreign capital in the authorized capital of banks, %	direct
The ratio of the state and state-guaranteed debt to GDP, %	Deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP	reverse
	The share of loans in foreign currency in the total amount of loans granted, %	direct
	Dollarization of the money supply, %	direct
	Specific weight of cash outside banks in the total amount of money supply (M0/M3), %	direct
	Share of consumer loans granted to households in the general structure of loans granted to residents, %	reverse
	Total export of financial resources outside the country, billion dollars USA	direct
Deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP	The index of the change in the official rate of the national currency to the US dollar, the average for the period	reverse
	The share of loans in foreign currency in the total amount of loans granted, %	reverse
	The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national	direct

	currency of the country, in relation to the consumer price index	
	The average weighted yield of T-bills (government bonds) in the primary market	reverse
	The ratio of the state and state-guaranteed debt to GDP, %	reverse
	Return on assets, %	direct
Level of GDP redistribution through consolidated budget, %	Gross international reserves of Ukraine, months of import	direct
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	direct
	Total export of financial resources outside the country, billion dollars USA	direct
	The ratio of the deficit / surplus of the state budget to GDP, %	direct
	Level of capitalization of listed companies to GDP	reverse
	Ratio of liquid assets to short-term liabilities, %	direct
The index of the change in the official rate of the national currency to the US dollar, the average for the period	The share of loans in foreign currency in the total amount of loans granted, %	direct
	The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	reverse
	Deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP	reverse
	The average weighted yield of T-bills (government bonds) in the primary market	direct
	Volatility level of the PFTS index, the number of critical deviations (-10%)	direct
	The ratio of bank loans and deposits in foreign currency, %	direct
The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	Gross international reserves of Ukraine, months of import	direct
	Level of GDP redistribution through consolidated budget, %	direct
	The ratio of the deficit / surplus of the state budget to GDP, %	direct
	Level of capitalization of listed companies to GDP	reverse
	Level of insurance penetration (insurance premiums to GDP), %	reverse
	Ratio of liquid assets to short-term liabilities, %	direct

Source: suggested by the authors.

The results of modeling the correlation between the indicators of Ukraine financial security allowed to identify several indicators that have a large number of interrelated factors. Therefore, the level of capitalization of listed companies to GDP correlates with ten indicators of financial security; the ratio of the deficit / surplus of the state budget to GDP, %, gross international reserves of Ukraine, the share of loans in foreign currency in the total amount of loans granted correlate with seven indicators; ratio of liquid assets to short-term liabilities, the ratio of the state and state-guaranteed debt to GDP, deficit / surplus of budget and

extrabudgetary funds in the sector of the state administration to GDP, the level of GDP redistribution through consolidated budget, the index of the change in the official rate of the national currency to the US dollar, the difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU) correlate with six indicators of financial security of Ukraine. The total capitalization of listed companies as an indicator of the value of capital existing in the form of securities traded on stock exchanges, primarily in the form of shares, integrates other indicators of the financial market, so its inclusion to the integrated indicator of financial security enhances its impact on the overall level. Thus, we recommend to remove this indicator from the method of Ukraine's financial security assessment. Gross international reserves of Ukraine, the share of loans in foreign currency in total correlate with indicators of currency, budget security, security of non-banking financial market, also have limited independent value for calculating financial security, so it is appropriate not to take them into account while assessing the integrated indicator. Concerning those indicators that have a smaller number of interrelated factors, in the method of calculating it is advisable to leave the amount of public and state-guaranteed debt to GDP, deficit (surplus) of budget and extrabudgetary funds in the sector of the state administration, the index of the change in the official rate of the national currency to the US dollar as indicators illustrating the overall financial picture of the state stability.

After our formation of an improved list of financial security indicators, the prospects for further research in this area are to determine the values characteristic of the indicators; rationing of indicators; determination of weights; calculation of the integrated financial security index as a whole. In this case, to calculate the integrated index, it is appropriate to use Harrington's Desirability Function [Harrington, 1965]. The Harrington scale establishes a correspondence between linguistic estimates of the desirability of the values of x and numerical intervals d (x) (Table 8).

Table 8. Numerical intervals of the Harrington scale

Linguistic assessment	Intervals of values of the desirability function d(x)
Very good	1,00-0,80
Good	0,80-0,63
Satisfactory	0,63-0,37
Bad	0,37-0,20
Very bad	0,20-0,00

Source: [Harrington, 1965].

With such scaling, the values of the desirability function d (x) of the level of financial security vary in the range from 0 to 1, and the value of di≈0 corresponds to the absolutely unacceptable value of the i-th indicator being evaluated, and di≈1 – the ideal value. In practice, the Harrington scale is often limited to three gradations, which corresponds to the linguistic categories of "bad", "satisfactory", "good". In this case, the area corresponding to the level of "satisfactory" expands from 0.37 to 0.69, and the areas of "bad" and "good" are characterized by intervals 0.00-0.37 and 0.69-1.00 respectively [Proskurnina, 2020].

Analytically for monotonic criteria, the Harrington desirability function is given by the following formula:

(2) $$d_i = d(z_i) = exp[-exp(-z_i)]$$

(3) $$z_i = \frac{x_i - x_{i0}}{x_{i1} - x_{i0}}$$

where z_i – coded values of the i-th indicator, which are dimensionless quantities; x_i – the value of the i-th informative indicator; x_{i0} and x_{i1} – the boundaries of the region "satisfactory" in the initial scale.

The introduction of the desirability scale allows to reduce the initial (original) multicriteria decision problem with different criteria to a multicriteria problem with criteria measured by one scale, so the next step is to collapse the partial desirability functions d_i into a generalized criterion D.

Advantages of using desirability functions in a preliminary design context come from the multicriteria ranking of every candidate solution, even the undesirable ones (if one of the criteria is not completely satisfied, the level of desirability is close to zero but not null). Moreover, the specification of the AC and SL values lead to a soft formulation of constraints, and thus, provides the design problem with a high degree of flexibility [Quirante, Sebastian & Ledoux, 2012].

Conclusions

The analysis of methodical approaches to the assessment of financial security revealed that separate indicators, taken as a basis for calculating the integrated level of financial security, are very closely related to other indicators. Consequently, «The ratio of the deficit / surplus of the state budget to GDP, %» is closely correlated with seven indicators, three of which have a very close relationship. «The ratio of the state and state-guaranteed debt to GDP, %» is closely correlated with six indicators, whereas with two – very closely. The level of capitalization of listed companies to GDP correlates with ten indicators of financial security, two of which have a very close relationship. Gross international reserves of Ukraine, the share of loans in foreign currency in the total amount of loans granted correlate with seven indicators of financial security, ratio of liquid assets to short-term liabilities, the ratio of the state and state-guaranteed debt to GDP, deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP, level of GDP redistribution through consolidated budget, the index of the change in the official rate of the national currency to the US dollar, the difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU) correlate with six indicators of financial security of Ukraine.

The authors propose to remove from the Methodical guidelines on the calculation of the level of economic security of Ukraine such indicators characterizing financial security as: Level of capitalization of listed companies to GDP, Gross international reserves of Ukraine, The share of loans in foreign currency in the total amount of loans granted, Ratio of liquid assets to short-term liabilities, Level of GDP redistribution through consolidated budget. The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU). The changes of method to the diagnosis of the state financial security level will allow us to obtain a relevant information base for the analysis of the state financial security and make appropriate decisions concerning neutralization of threats and strengthening of security. Further research in this area should be conducted in the context of the financial security indicators optimizing according to their groups - budget security; currency and monetary security; currency security; debt security; non-banking security; stock market security; banking security. They should also be aimed at determination of optimal parameters to the assessment of the financial security integrated level.

Consequently, our research and refinement of the list of financial security indicators on the basis of correlation and regression analysis is an important element and prerequisite for the development of an integrated model for the state financial security assessment.

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The human factors of the national economic development: a comparative analysis of Poland and Ukraine

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Abstract. A comparative assessment of the level of economic progress and indicators of human development in Poland and Ukraine as interconnected and at the same time strategic factors in building a competitive national economy has been carried out. The range of factors related to human development and the use of the country's labor potential, affecting the competitiveness of the national economy as a result of economic development, has been determined. These factors include: labor productivity, reflecting managerial, economic, institutional potential of competitiveness; educational turnover in the country, which characterizes the ability of the labor market to accept highly qualified specialists; the level of educational load on the population, which indicates the readiness and intentions of the country and its labor potential to move to the knowledge economy. A statistical model for determining the influence of these factors on the discrepancy between the levels of economic development of Poland and Ukraine has been built; using a statistical model, the influence of these factors was determined. The performed calculations of the influence of the factors of the role of freedom were to determine the reasons for Ukraine's lag behind Poland, concerning human development. The ways of increasing the rates of economic development of Ukraine on the basis of increasing material incentives, increasing costs for education, increasing educational burden on the population, using the mechanism of intentions are proposed.

Key words: competitiveness, human development, economic development, labor productivity, education, intentions.

JEL: J01, O15

Introduction

In modern conditions of globalization, building a competitive economy is the main task of national strategic management. An important clause for the implementation of this task is to study the issues of a generalizing assessment of the level of economic development of the national economy, as well as the factors that ensured it. The level of gross domestic product, traditionally used as a characteristic of development, is the quintessence of organizational, economic, institutional, managerial and other components of the national economic system.

The rate of development and competitiveness of the national economy as a result of the implementation of the economic strategy depends on many reasons, but the main factor is the human, which is expressed in the level of a) human development and b) labor efficiency.

The level of human development concentrates not only the results of the economic development strategy of the country, but also of the education systems. The latter is one of the areas in which conditions for the reproduction of labor power, and, consequently, labor efficiency, are formed. Human development as an economic goal and at the same time an instrument of economic growth, in the opinion of Vasyl Miklovda, Natalya Kubiniy and Sergey Moshak, «finds practical implementation in the potential of labor, the implementation of which ensures the purposefulness of the entire economic system; consistency of functioning of constituent elements of economy; monitoring the development of the economy and ensuring its competitiveness» [Miklovda V., Kubiniy N. & Mjshak S., 2015], which ensures the growth of labor efficiency as an indicator of the country's economic ontogenesis. The role of the human factor is indirectly confirmed by researchers who adhere to The Resource Curse Hypothesis, and argue that “countries with high natural resource endowments have experienced lower economic growth rates than countries with scarce stocks of natural resources. The resource curse is paradoxical, because production of natural resources has been the initial source of nearly all development, providing an almost immediate source of foreign exchange, attracting foreign capital and skills and increasing the availability of both raw materials for processing and a market for manufactured inputs" [Costantini V. & Monni S., 2008].

Labor productivity is a systemic tool with a wide range of impacts. First of all, the growth of labor productivity acts as an intensive factor in increasing the volume of gross domestic product as an indicator of the competitiveness of the economic system as a whole and the result of strategic management. Labor productivity, the level of which is calculated by the ratio of the gross domestic product and the number of employees, makes it possible to identify the quality of the development strategy. Secondly, the growth in labor productivity causes an increase in wages, which is the main source of human capital.

Thus, the determination of ways to increase the competitiveness of the national economy, which lie in the sphere of human potential and its labor component, is an important scientific task and is of great practical importance.

Theoretical premises

Determining the ways of economic development and the formation of competitive national economies are in the focus of scientific interests of a wide range of researchers. One of the most common approaches to studying this problem is to study the influence of spatial organization on the level of economic development. So, of interest is the publication by Przemysław Sleszy´nski, Adam Kowalewski, Tadeusz Markowski, Paulina Legutko-Kobus and Maciej Nowak, who study the impact of spatial chaos on economic development and defines: "The total annual costs of spatial chaos were estimated at not less than 20 billion euros per year». [Przemysław Sleszy´nski, Adam Kowalewski, Tadeusz Markowski, Paulina Legutko-Kobus & Maciej Nowak, 2020]. At the same time, the authors do not show how the elimination of spatial chaos will affect the growth of labor productivity, which ensures the efficiency of the economic system and its competitiveness. To some extent, the relationship between spatial organization improvement and job creation has been explored by Czerny, M., & Czerny, A . Considering the role of the spatial organization of the economy on the example of South and Central America, the authors argue that from external influence, "the most important actor in the shaping of regions' socioeconomic space is globalization - the global interests of enterprises representing different sectors of the economy ... is to go on being satisfied and often decide the locations of new infrastructural development, and therefore also the places in which new job opportunities arise"[Czerny & Czerny, 2019], which indicates economic development. At the same time, the creation of new jobs should be accompanied by an increase in labor productivity in the country as a whole, otherwise economic growth will be extensive, which requires additional costs and does not ensure compliance with the principle of efficiency.

The school of researchers of methodological and statistical aspects of assessing the level of development is of great interest. Among the representatives of this direction, one cannot but agree with Thomas V. and Chindarkar N., who emphasize the importance of correct measurement of development for the development itself [Thomas & Chindarkar, 2019]. Rafał Czyżycki proposes an improvement in methodological approaches to the analysis of economic development, arguing that "one of the factors significantly affecting the final result of ordering the regions in terms of socio-economic development is the choice of method used to obtain a synthetic measure of development" [Czyżycki, 2018]. In addition, when choosing a particular

method of assessing labor productivity itself, it is advisable to take into account Myklovda's comments declaring that “one of the main criteria for competition is labor efficiency" [Miklovda, Kubiniy & Moshak, 2015], which, in this study, is measured by the productivity of the national economy. Burda Michael C. declares the idea that “labor productivity depends on a host of factors that make it susceptible to significant measurement error. A correct assessment of these factors is crucial for our understanding of how labor markets operate in both the long and short term” [Burda, 2018]. At the same time, it is advisable to expand the research content of this school with analytical factor models.

It is advisable to highlight the problem of studying the dependence of the country's economic growth on the level of investment in human potential, which significantly enhances labor potential and contributes to an increase in labor productivity. Gustav Ranis and colleagues consider human development “the central objective of human activity and economic growth as potentially a very important instrument for advancing it” [Ranis, Steward & Ramire, 2000]. Kuada J. concludes that “economic development is both multidimensional and highly nonlinear. It entails dynamic change not only in production patterns and technology but also in social, political and economic institutions, as well as in patterns of human development” [Kuada, 2015]. Investments in people and education in rural regions of Poland as a way of progress was observed by Bazyli Czyżewski and Jan Polcyn (2016) as the important factor of development and “it was shown that in Poland, the theories of polarized development are more applicable than those of endogenic development” [Czyżewski & Polcyn, 2016]. The focus on human development as a driver of economic growth is underlined by Eric A. Hanushek [2013]. The role of the human factor is indirectly confirmed by researchers, adherents of "The Resource Curse Hypothesis", who argue that “countries with high natural resources endowments have experienced lower economic growth rates than countries with scarce stocks of natural resources. The resource curse is paradoxical because production of natural resources has been the initial source of nearly all development, providing an almost immediate source of foreign exchange, attracting foreign capital and skills and increasing the availability of both raw materials for processing and a market for manufactured inputs” [Costantini & Monni, 2008].

Another direction in the investigation of human potential and its effective use in the economy is the study of behavioral factors, among which there are intentions that perform an important function; in our previous publications, there was insisted the conclusion about the

importance of intentions for human development and "the formation of new knowledge and its transformation into innovation as the basis of the competitiveness of the economic system" [Kubiniy, 2019].

At the same time, insufficient attention of researchers is paid to the problems of identifying the factors of human development that affect the competitiveness of the economy. The range of factors traditionally used in the analysis of human development is not supplemented by new indicators that contribute to the study of their impact from different angles.

The above descriptions determined the setting of the article's goal - research and comparative analysis of the influence of factors on the economic development in Poland and Ukraine.

To achieve the goal, the following tasks were solved:

1. Identification of factors influencing the level of economic development.
2. Building a statistical model of the influence of factors in Poland and Ukraine and measuring the degree of influence.
3. Justification of proposals to intensify actions aimed at increasing the pace of development and the formation of a stable competitive economy in Ukraine.

Methodology

During the study, we used the methods of causal induction, which allows us to establish a causal relationship between the productive and factor indicator (in our study, between the level of GDP per capita and factors of human and labor potential), scientific abstraction, which allows us to form a logical model of the influence of intentions on human development and focus on the determinants of development.

When choosing a statistical method for analyzing the influence of factors on the level of economic development, we were guided by the following principles:

- simplicity of calculations,
- clarity of statistical logic,
- availability of information for analysis.

It is possible to identify the influence of the factor of labor productivity and the training of skilled labor on the level of development of the national economy (EDC) using a statistical model:

(1) $$EDC = f(W * ET * N)$$

(2) $$W = \frac{GDP}{NP}$$

GDP – gross domestic product

NP- population of the country.

The next factor is number of employees per student

(3) $$ET = \frac{E}{HS}$$

E –number of employees,

HS – number of students of higher education.

We call this indicator educational turnover (ET); the higher this coefficient, the more opportunities students have for employment. In other words, this indicator characterizes:

a) the ability of the labor market to accept graduates of higher education,
b) indirectly – the level of development of the economy, which needs highly qualified specialists.

The next factor, the educational burden on the population (EL), is calculated by dividing the number of students by the number of the population.

(4) $$EL = \frac{NS}{NP}$$

The significance of this factor is that it shows the following:

a) the strategy of the state to increase the level of human development through the education system;
b) the level of education of society, which is especially important in the context of the transition to the knowledge economy and the need to live and work in an innovative society.

Results

A comparative assessment of the gross domestic product in Poland and Ukraine is presented in Table 1, the data of which suggest that the level of competitiveness of Poland

is significantly higher than that of Ukraine, despite the fact that the growth rate of the gross domestic product in Ukraine in 2019 compared to 2015 was higher than in Poland.

Table 1. Main indicators of the economic development of Poland and Ukraine in 2015-2019.

Indications		2015	2016	2017	2018	2019	Growth rate 2019/2015,%
Poland	GDP, bil .dol., PP	478	472	527	587	592	123.8
	Average number of employees, mln. persons	16	15	16	16	16	100.0
	Labor productivity, thous. dol.	31	31	33	37	37	119.4
Ukraine	GDP, bil. dol., PP	90	93	112	131	155	172.2
	Average number of employees, mln. persons	16	16	16	16	17	106.3
	Labor productivity, thous. dol.	6	6	7	8	9	150.0
Labor productivity in Poland/labor productivity in Ukraine		5.2	5.2	4.7	4.6	4.1	X

Sources: based on Knoema, Average number of employees and self-employed in Poland from 2003 to 2019, Employed persons by public and private sector in Poland 2008-2018, Swaid, Statistics Poland, Statistical Yearbook of Ukraine for 2017, Statistical Yearbook of Ukraine for 2018, Statistical Yearbook of Ukraine for 2019.

As follows from the data shown in Table 1, during the survey period, there is an increase in labor productivity, but the ratio of labor productivity levels shows that in Ukraine the efficiency of labor force use was four times lower in 2019 than in Poland.

The level of labor productivity and the level of human development are interconnected, with the data presented in Table 2.

Table 2. The number of people employed and students in Poland and Ukraine in 2015-2019

Indicatioins		2015	2016	2017	2018	2019
Poland	Total population, mln. persons.	38.4	38.40	38.4	38.4	38.4
	Employed persons, mln	14. 8	15.3	15.7	15.9	16.1
	Number of students, thous.	1,405.1	1,348. 8	1,291.9	1,230.3	1,204.0
	Number of foreign students, thous.	57.1	65.8	72.7	78.3	82.2
	Public expenditure on education in relation to GDP, %	4.44	4.36	4.30	4.33	4.33
Ukraine	Total population, mln. persons	42.6	42.4	42.2	42.0	41.7
	Employed Persons, mln	16,0	16.3	16.2	16.4	16.6
	Number of students, thous.	1,375.2	1,369.4	1,330.0	1,322.3	1,266.1
	GDP, bil.grn..	1,988.5	2,385.4	2,983.9	3,560.6	3,974.6
	Public expenditure on education, mln. grn	114,193.5	129,437.7	177,915.8	210,032.3	238,758.7
	Public expenditure on education in relation to GDP, %	0.06	0.05	0.06	0.06	0.06

Sources: based on Bank Danych Makroekonomichnych, Number of studying foreigners in Poland 2014-2020, Higher education. Swaid, Statistics Poland, Statistical Yearbook of Ukraine for 2017, Statistical Yearbook of Ukraine for 2018, Statistical Yearbook of Ukraine for 2019.

Due to the changes in the budget classification, since 2019, expenditure on education relative to GDP has been presented together with expenditure on science (4.75%). That is why we accepted the figure, equal 2018 level – 4.33%.

The information presented in Tables 1 and 2 allows to build a statistical model of the influence of factors on the level of development and determine which of them had the greatest impact on the excess of the development indicator of the Polish economy in comparison with the Ukraine.

The factor model of Poland's economy has acquired the following numerical exposition:

(5) $$\frac{GDP}{population} = 15416{,}6720 = 36770{,}1900 * 13{,}4167 * 0{,}03125$$

In Ukraine:

(6) $$\frac{GDP}{population} = 3717{,}0177 = 9337{,}3500 * 12{,}7692 * 0{,}03118$$

The influence of factors is as follows.

Effect of labor productivity (EW):

(7) $$EW = (36670{,}1900 - 9337{,}3500) * 13{,}4167 * 0{,}03125 = 11501{,}7925$$

Effect of educational turnover (EET):

(8) $$EET = 9337{,}3500 * (13{,}4167 - 12{,}7692) * 0{,}03125 = 188{,}9267$$

Factor of educational burden on the population influence (EEL) effects:

(8) $$EEL = 9337?\,3500 * 12{,}7692 * (0.03125 - 0{,}0318) = 8{,}3461$$

Total effect: 11,700 US dol.

Negative factors influencing the level of development of Ukraine regarding human development and, accordingly, labor potential are as follows:

1. Low wages, which should serve as a motivator for high labor productivity. The average salary in Poland in 2019 was 31,970 US dollars, while in Ukraine it was 3,988, the ratio of the levels is eightfold. The ratio of wages and labor productivity in Poland and Ukraine is shown in Fig. 1.

Figure 1. Labour productivity and salary in Poland and Ukraine, 2019, US Dol.

Sources: based on Table 1, Table 2, Swaid, Statistics Poland, Statistical Yearbook of Ukraine for 2017, Statistical Yearbook of Ukraine for 2018, Statistical Yearbook of Ukraine for 2019.

In the absence of material incentives for labor, labor efficiency falls, which significantly reduces the economic development potential.

2. Insufficiently high level of human development for a European country, published in the UN Reports. Table 3 presents data on the human development index of Norway, which consistently ranks first in the ranking of countries, Poland and Ukraine for 2015-2019.

Table 3. Human Development index Poland and Ukraine 2015-2019.

	2015	2916	2017	2018	2019
Norway	0.949	0.950	0.953	0.954	0.957
Poland	0.855	0.870	0.865	0.872	0.880
Ukraine	0.743	0.770	0.751	0.750	0.779

Source: based on Human Development Report 2016, Human Development Report 2018, Human Development Report 2020.

As follows from the data in the table, the level of human development in Ukraine is significantly lower than in the compared countries. One of the reasons for this situation is the low indicator of gross domestic product per capita, which speaks of a vicious circle: a low indicator of human development inhibits economic growth, and the slowdown in economic progress in the country reduces the human development index.

3. Inadequate financing of the education system. As follows from the above data, the share of government spending in Poland on education is more than 4% of the gross domestic product, and in Ukraine - less than 1%. At the same time, the gross domestic product is 3.8 times higher in Poland than in Ukraine. Strengthening the financial support of education and science is a strategic task of Ukraine in the context of the transition of the world economy to a knowledge economy, in which a person and their level of knowledge are the main factors in building a competitive economic system of the country.

Thus, the main directions of increasing labor productivity in Ukraine are highlighted: increasing the level of wages, increasing financial support for education, carrying out a set of measures aimed at increasing the indicator of human development.

To ensure the harmonious development of the economy, it is proposed to observe the "Golden rule of competitive proportion": The specified proportion provides a condition for the regularity of development of all components of economic development and building competitiveness considered in this study.

The growth rate of gross domestic product should be higher than the growth of employees.

The growth rate of employees should be higher than the growth of number of students.

The rate of number of students should be higher than the growth of population.

$$Golden\ rule\ of\ competitive\ proportion =$$
$$Growth\ rate\ of\ GDP > Growth\ rate\ of\ emploees\ >$$
$$Growth\ rate\ of\ students\ > Growth\ rate\ of\ population$$

An important direction of stimulation is recommended to activate the mechanism of intentions, that is, systemic, clearly defined, strategically verified development goals. The role of intent was emphasized by the Japanese researcher Nonako Ikudjiro, who described the spiral of knowledge and proved that the spiral is driven by intent. Thus, intention acts as a driving force, a lever for the development of the knowledge economy and, accordingly, human potential as the basis of the knowledge economy. To implement these areas, it is recommended to develop a national strategy for the development of human potential in Ukraine, with a specific program for its implementation.

Summary, recommendations

The human factor in modern conditions is decisive in building a system of competitiveness of the national economy.

The results of the analysis show that the level of development of the Polish economy is significantly higher than that in Ukraine. At the same time, Poland is also significantly ahead of Ukraine in terms of labor productivity, average wages, and the level of human development.

The constructed statistical model for analyzing the human components of economic development made it possible to confirm the factors due to which Ukraine lags behind.

The reasons for the lagging have been identified, including: a low level of material incentives for those employed in Ukraine, lack of an adequate level of funding for education, insufficient attention of the state authorities to the problems of human development. The elimination of these reasons is complemented by the use of the intention mechanism. The main directions of increasing the level of economic development in this study are as follows:

1. Creation of a human development strategy in Ukraine and preparation of a program for its implementation; the program will link strategic development intentions with concrete practical actions.
2. Strengthening financial support for the education system in Ukraine.

3. Improving the analytical base of the influence of factors on the level of economic development. Application of the rule of harmony.

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Sustainable development – the goal or source of global progress

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Abstract: One of the most important concepts of the development of the modern world is the successful conception of development policy and the identification of the impulse of sustainable development. Previous growth and development theories, based on quantitative theories and only economic growth determinants, are outdated from today's perspective and less in use. Contemporary world implies a holistic approach to development, according to which the priority is the formation of a coherent national development policy in line with the UN Agenda 2030. The focus of the analysis of the paper is on sustainable development indicators. The aim is to consider the effects of certain sustainable development indicators, to analyse the indicators at the EU level and confirm the importance of introducing the indicators into the national development strategy. The results of the analysis have proved that more flexible economic systems displayed a higher level of efficiency and reached a high level of the value of the set sustainable development indicators. The introduction of new sustainable development indicators at the national level can become imperative for future researches.

Key words: Sustainable Development, SDGs EU, Poland, Serbia

JEL: Q01, P52, O44

Introduction

In recent years, sustainable development has become a major topic, along with digitalization and the green economy. The adoption of the 2030 Agenda by the UN (2015) was preceded by two years of negotiations on the priority areas of international cooperation within the field of UN development policy, happening also after the deadline for the implementation of the Millennium Agenda. Four components were discussed: Political Declaration, Sustainable Development Goals, Global Partnership and the Implementation of the Measures and Rules for Reviewing and Monitoring Process. The goal of adopting the 2030 Agenda implies the overall transformation of the financial, economic and political system that governs our societies in order to ensure human rights (UN, 2020). The initiatives of the most developed countries worldwide, numerous campaigns, summits on this topic and increasing number of research papers in this field undoubtedly indicate how important this topic is. Over time, data series for most countries have become available for all 17 targets and

231 unique indicators[14]. Long time series data[15] allow us to conduct a comparative analysis between countries by measuring the degree of sustainability of economies. Simultaneously, this enables the adoption of precise assessments regarding the definition, application, and implementation of these indicators in national development strategies. Currently, the sustainability of the indicators is further growing due to the COVID-19 pandemic - the health, economic and social crisis is threatening lives and livelihood (UN 2020).

This paper is divided into four thematic units. After the introductory part and literature review, there is an overview of indicators from the UN 2030 Agenda, EU priorities for the period 2019-2024, and sustainability indicators from the development strategies of Poland and Serbia. We chose Poland because of the best results of SDG indicators during EU membership, out of all ten member states since 2004. Also, these results can be a benchmark for Serbia as the country with the best results of indicators in relation to other potential candidates for EU membership. Chapter 4 will analyse the degree of the connection of EU priorities, sustainability indicators of Poland and Serbia with the UN 2030 Agenda. The discussion of the results is discussed in Chapter 5. The last part presents concluding remarks.

Literary Review

The holistic nature of sustainable development indicators implies the existence of a large number of potential interactions between the goals, as well as the interaction between the indicators. Hence, there is growing importance of including sustainable growth indicators in the national development strategy of all countries. This phase needs to be accompanied by raising individuals' awareness. If individuals are really aware of the importance of implementing all sustainable development indicators, then their interaction will be much simpler. Public institutions, companies, organizations, and individuals are invited to meet this challenge.

García-Feijoo et al. (2020) and Weybrecht (2017) analysed the role of business schools and knowledge management in achieving sustainable development goals and the ways in which they can be engaged in the activities. Pradhan et al. (2017) state that SDG 1 (No Poverty) has a synergistic relationship with many SDGs, while SDG 12 (Responsible Consumption and Production) is associated with trade-offs, especially in terms of economic

[14] https://unstats.un.org/sdgs/indicators/indicators-list/ (seen 26.02.2021; 5:56 pm)
[15] https://unstats.un.org/sdgs/indicators/indicators-list/ (seen 26.02.2021; 5:56 pm)

progress. On the other hand, Kroll et al. (2019) wondered how much humanity is able to maximize synergies and resolve existing trade-offs between SDGs. They showed examples of successful transformation of trade-offs into synergies, but also stated the impossibility of overcoming certain persistent trade-offs, which can seriously jeopardize the achievement of the 2030 Agenda. Similarly, Schmidt et al. (2015) analysed whether there is cohesion between public health, universal health insurance, and SDGs. They pointed out that strong cohesion is needed to resolve the dilemma. Lusseau & Mancini (2019) believe that cohesion is difficult to achieve when it comes to limiting climate change, reducing inequality and responsible consumption, but it is easily achievable in poverty alleviation and reducing inequality. However, with SDGs, a new level of ability to classify interactions has emerged so that these issues can be examined more systematically in the future (Costanza et al., 2016; Rickels et al., 2016; Nilsson et al., 2016).

Sustainable development indicators – UN, EU, Poland, Serbia

In August 2015, the leaders of 193 countries agreed on 17 global goals that will make the world a better and healthier place to live in the next 15 years. The official Sustainable Development Goals (SDGs) were set. The intention was clear, setting goals which will create a better world by 2030, eliminating poverty and hunger, fighting inequality, addressing the urgency of climate change, behaving responsibly towards society, a higher level of education. The goal defined in this way is a task for all countries, all governments, all companies, all individuals, to work together to build a better future for all of us and future generations. It is possible to achieve it by preserving the environment, maintaining a quality system, adequate state incentives, and environmental education. The speed at which countries will adapt to these goals and the common global interest will be reflected in the ability of their governments. Since an efficient and flexible system gives better results, it is of global interest to improve the conceptual and responsible approach, along with the guidelines for its implementation.

The UN Expert Group on sustainable development indicators approved a set of 230 individual indicators for monitoring the progress to achieve SDGs (UNESC, 2016). Currently, the United Nations Statistics Division can provide the data on 231 indicators out of a total of 227 countries for the period between 1983 and 2019. The data are classified by countries,

gender, age, urban and rural population or income groups. Multiple time series are available for the same indicator.

The EU's first concrete steps towards sustainable development were made in the EU Sustainable Development Strategy (EU SDS) in 2001 (revised in 2006). With the global initiative of the 2030 Agenda, the European Commission announced in 2016 the integration of SDGs in the EU policy and adopted a special set of 100 indicators for monitoring Sustainable Development Goals (source: EUROSTAT). In its new set of goals for the period 2019-2024, Europe aims to become a modern, resource-efficient, digital economy with attractive investment environment, having the growth that generates quality jobs, especially for young people and small businesses. Strengthening of the EU will be achieved by advocating for multilateralism and a rules-based global order, and protecting the rule of law and democracy (von der Leyen, 2018).

Table 1. Sustainable Development Indicators

	UN 2030 Agenda	EC priorities for 2019-24	Poland	Serbia
1	No Poverty	A European Green Deal	SP II	MG 2
2	Zero Hunger	A Europe Fit for the Digital Age	SP I, SP II	MG 2
3	Good Health and Well-Being	An Economy that Works for People	SP I, SP II, SP III	MG 2
4	Quality Education	A Stronger Europe in the World	SP I, SP II	MG 2
5	Gender Equality	Promoting European Way of Life	SP II	MG 2
6	Clean Weather and Sanitation	A New Push for European Democracy	SP II	MG 3
7	Affordable and Clean Energy		SP I	MG 3
8	Decent Work and Economic Growth		SP I, SP II, SP III	MG 1
9	Industry, Innovation, and Infrastructure		SP I, SP II, SP III	MG 1
10	Reduced Inequalities		SP I, SP II	MG 2
11	Sustainable Cities and Communities		SP I, SP II, SP III	MG 3
12	Responsible Consumption and Production		SP I	MG 3
13	Climate Action		SP I	MG 3
14	Life Below Water		SP III	:
15	Life and Land		SP III	MG 3
16	Peace, Justice and Strong Institutions		SP I, SP II, SP III	MG 4
17	Partnerships for the Goals		SP I, SP III	MG 4

Source: Authors' calculation

Note: SP – Strategic priorities in Poland: SP I – Social, SP II – Economic, SP III – Environmental

MG – Mapping groups in Serbia; MG 1 – Economic, MG 2 – Human resources, MG 3 – Environmental, MG 4 – Institutional

Poland has paved the way for development indicators through the Strategy for Responsible Development (SRD), which was adopted by the Council of Ministers on February 14, 2017 - the Polish perspective for sustainable and responsible development (Government of Poland, 2018). A serious discussion on defining a new development path was launched in 2018. The presented Strategy focused on a new approach to development policy and the identifiation of new impulses for development. The high degree of compatibility with the 2030 Agenda was visible in many aspects: at the level of objectives, areas and priority actions, and development indicators. The Polish sustainable development strategy was conceived through three basic dimensions of sustainable development.[16] Within the social dimension - SP I (SDG: 1, 3, 4) puts emphasis on reducing social exclusion, poverty, and all kinds of social inequalities with the aim of improving the quality of life of citizens, along with the development of human and social capital through education, skills, knowledge, and health care of citizens. Economic dimension - SP II (SDG: 2, 8, 9) implies the construction of modern industry, investment in innovation, the use of modern information technology knowledge, digitalization of production processes with high added value, along with the inevitable support for entrepreneurship, internationalization of Polish companies and promotion of Polish brands abroad. In the environmental dimension - SP III (SDG: 6, 11, 12, 15), the aim is to improve the environment (air quality in Polish cities, soil protection, reducing the impact of noise, and electromagnetic fields) and sustainable resource management by increasing available water resources, water quality, rational management of natural and geological resources, as well as efficient waste management. Moreover, Poland is determined to encourage socially and territorially sensitive development, with a high level of employment, quality jobs and a high volume of entrepreneurship, where the benefits of economic growth should be available to everybody (SDG 10). All of the above monitor the efficiency and effectiveness of the state and its institutions (quality of adopted laws, efficient administration, strong system of strategic management of development processes, etc.) (SDG 16). Finally, Poland undoubtedly bases its development process on cooperation, partnership and joint responsibility of public entities, companies, and citizens. In doing so, the implementation of the set sustainable development goals depends on the achievement of five related units: Selective Interventions, Education for Sustainable Development, Organizational Structures, Coherence of Development Policies, and

[16] https://sustainabledevelopment.un.org/content/documents/18881Main_Messages_Poland27s_VNR_short.pdf

Effective Control. In this context, it is planned to connect 44 Polish capital cities, organize 16 regional agencies with the active participation of the economy, public institutions, scientific and research institutions, non-governmental sector, as well as other stakeholders.

Nowadays, Poland bases its sustainable development activities on "5ps", according to the 2030 Agenda (people, planet, prosperity, peace, partnership). The National Development Strategy supports SDGs, aiming to implement all the indicators. In achieving SDGs with an environmental dimension, Poland improves the environment and strives for sustainable resource management, through the priorities of SDGs – 2, 3, 6, 7, 11, 12, 13, and 15 (Government of Poland, 2018). Furthermore, citizens have become more environmentally aware in recent years; increasing awareness about air quality protection and climate change. Institutionally, The Polish Government made a major step forward and established the new Ministry of Climate, independent of the existing Ministry of the Environment.

The Sustainable Development Strategy in Serbia is adapting to the 2030 Agenda, with all 17 goals, including three dimensions of sustainable development: economic growth, social inclusion, and environmental protection. The figures show that only 39.2% of the indicators from the total number of SDGs in 2020 are available.[17] A brief overview of sustainable growth indicators was prepared in Serbia, and implemented by the Centre for Advanced Economic Studies – CEVES (CEVES, 2018) and the Swiss Agency for Development and Cooperation (SDC). This report presents certain indicators of the economy, which in certain sequences correspond to SDGs, but which are more focused on economic flows and available data. Even then, it was stated that there were no institutional capacities in Serbia and that these are the basic shortcomings for sustainable development. The priorities are set according to the administrative reform (Principles of Public Administration for EU candidate countries) and the Strategic Framework of Serbia, including the fulfilment of the conditions from the EU chapter. For the purposes of mapping SDGs, four groups are formed in the new document Serbia and the 2030 Agenda (PPC, 2019): (1) Economic Growth (SDGs 8 and 9), (2) Human Resources Development (SDGs 1, 2, 3, 4, 5 and 10), (3) Environment and Climate (SDGs 6,7, 11,12,13 and 15), (4) Institutions, Finances and Cooperation (SDGs 16 and 17). SDG 14 refers to the use of oceans and seas, so it was not included in the consideration. There are clear links between the umbrella development documents and the goals of the 2030 Agenda. The biggest step

[17] https://sustainabledevelopment.un.org/content/documents/18881Main_Messages_Poland27s_VNR_short.pdf

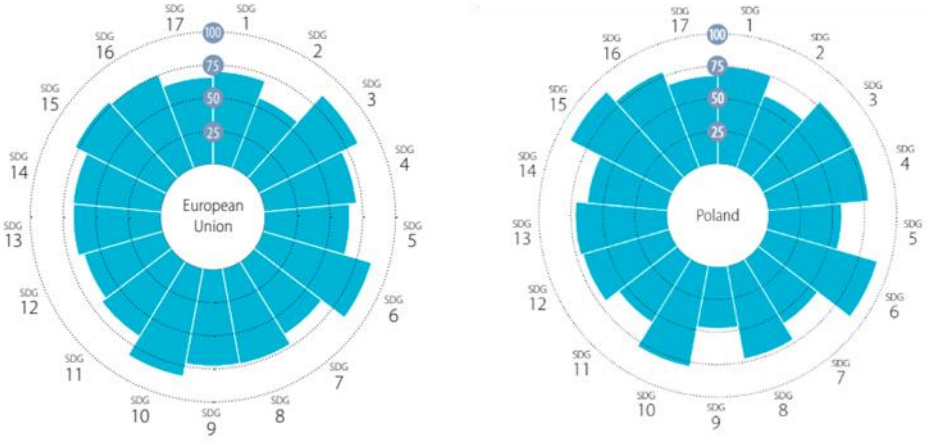
forward in considering SDGs, according to each indicator, was conducted by the Statistical Office of the Republic of Serbia (SORS, 2020).

The latest global SDGs Report 2020 states that Serbia and Poland have made a progress in the year with the pandemic compared to 2019. Serbia has climbed 11 places (from 44 to 33, out of 166 analysed countries; index value 75.2), while Poland has improved its position by 6 places (from 29 to 23; index value 78.1).

Results and Discussion

All the indicators of sustainable development for the EU, Poland and Serbia in the period 2005-2019 were analysed. The EU average was used to show the progress of Poland and Serbia in relation to EU members; while for Serbia, the comparison of the values of the indicators with Poland was used to see the necessary efforts of Serbia to approach EU members in terms of sustainable development. The results illustrate the progress of all the indicators, observed separately. The general impression is that Serbia lags behind in almost every indicator, while Poland is better than the EU average in some indicators. EUROSTAT data (Table A1) are available for all the indicators for the EU and Poland (see Graph 1), for almost the entire analysed period, while for Serbia a large number of data series are missing (available data series for 89 out of 231 indicators). Overall, the world is moving towards SDGs. This is particularly emphasised in lower middle-income countries as well as a low initial base (Sach et al, 2020). According to this report, the SDG index tracks a country's performance on 17 SDGs with equal weight for all 17 targets. The combined index of Poland (score 78.1, rank 23) and Serbia (score 75.2, rank 33) suggests that the country is on average 78.1% and 75.2%, respectively, of the way to the best possible outcome in 17 sustainable development goals.

Graph 1. Performance by SDG, 2020



Source: Sach et al, 2020

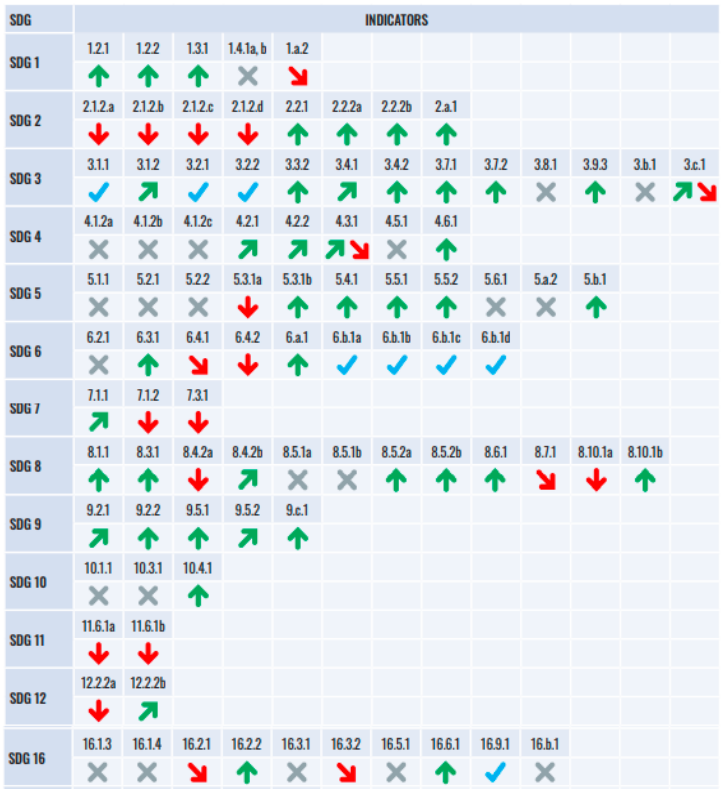
In the analysis of SDG 1 (*No Poverty*), where the emphasis is on eradicating extreme poverty and reducing relative poverty in the following 15 years, we noticed significant progress of Poland in reducing the risk of poverty and social exclusion of individuals (SDG_01_10, below the EU), significantly improved living conditions (SDG_01_60, below the EU), while the social protection benefits are higher for fewer employees (SDG_01_40, below the EU) compared to employed individuals (SDG_01_41, below the EU). In Serbia, the risk of poverty has been reduced, but insufficiently. Individuals who are part-time employees are still in trouble, while living conditions are slightly better than in previous years. Poland is also showing a progress with SDG 2 (*Zero Hunger*), where the focus is on safe and sufficient food production with minimal use of synthetic and chemical raw materials, which was mostly due to the increase in organic products (SDG_02_40). Serbia lags far behind in this indicator, because there are no sustainable and resilient production systems.

The health system and health care (SDG 3 - *Good Health and Well-Being*) have been significantly improved, so the life expectancy of the residents of both Poland and Serbia has been extended (SDG_03_10, below the EU), with the progress in the field of health protection against infectious diseases (SDG_03_41, lower rates than the EU average), and reducing environmental risk factors. SDG 4 (*Quality Education*) is an indicator that points to a step into the future through ensuring the access to fair and quality education at all stages of life. Poland has produced remarkable results - the number of early leavers from education has decreased (SDG_04_10A, below the EU), the participation of individuals with higher education has doubled in the analysed period (SDG_04_20, above the EU), and the employment rate

of recent graduates has increased (SDG_04_50, above the EU). This approach to education guarantees long-term economic growth. Serbia is making a slow progress in the field of education (far from the EU average) due to the lack of training and non-formal learning, that is, insufficiently acquired skills and competencies in education. *Gender Equality* (SDG 5) is a matter of individual self-awareness and democratic society. In Poland, there is a progress regarding this issue, but it is slow and worse than the EU average. The gender employment gap has been decreasing (SDG_05_30), the number of seats of women in the parliament and government is growing (SDG_05_50), as is the number of women in senior management positions (SDG_05_60). Serbia has the best results in this field.

The use of water and water resources is an important issue of development, but also of survival. SDG 6 (*Clean Weather and Sanitation*) unequivocally shows the treatment and use of water, sanitation and hygiene, and here Poland shows a high level of awareness and conscientiousness, especially in wastewater treatment (SDG_06_20). Serbia is making a slow progress, as there is insufficient awareness of the importance of water resources management. Energy (SDG 7 - *Affordable and Clean Energy*) is an important resource, like water. Poland is below the EU average in the field of energy both at the level of households (lower final energy consumption in households per capita - SDG_07_20) and at the level of the economy (lower energy productivity - SDG_07_30, lower share of renewable energy in gross final energy consumption by sectors - SDG_07_40), as well as the dependence of energy import by products - SDG_07_50). Serbia lags behind Poland in terms of this indicator, and is far from the EU average, because it does not have an affordable, reliable and sustainable energy system. Serbia has the lowest level of dependence of energy import by products compared to Poland and the EU. However, a low numerical value of the indicator may reflect a lower production volume, a smaller product range, a lower energy price, or low net energy export. This is an opportunity to emphasize that the research of the indicators is a complex job, because it implies a broader approach to the analysis of the indicators, their adequate combination, and impartial evaluation of the results.

Graph 2. SDG for Serbia, 2020



Source: Progress report on the implementation of Sustainable Development Goals by 2030 in the Republic of Serbia

The economic indicator (SDG 8 - *Decent Work and Economic Growth*) is rather satisfactory in the Polish economy. The average annual growth rate in this period of almost 4% enabled Poland to achieve the growth of real GDP per capita in euros (SDG_08_10, below the EU). The high growth rate of the economy (SDG_08_10, above the EU) was contributed by the investments (SDG_08_11, below the EU) with a share in GDP between 17.5% and 22.5% during the analysed period. This state of the economy enabled young people to get educated and work (SDG_08_20, below the EU), which reflected on employment growth (SDG_08_30, as in the EU), and significantly reduced long-term unemployment (SDG_08_40, far below the EU). In the part related to the indicator which shows a progress towards SDG 5 on gender equality (SDG_05_40) with the idea of promoting social and economic empowerment of women, Poland shows the result far above the EU average. Finally, resource productivity (SDG_12_20) is below the EU average. The situation in Serbia according to SDG 8 is not as favourable as in Poland. Economic growth of 3.1%, on average per year was not well structured. Although the share of investment was slightly higher than in Poland, it did not have

positive effects on employment and long-term unemployment. This means that the investments were not of a production nature. The issue of rational investment in the economy is provided by SDG 9 (*Industry, Innovation, and Infrastructure*) through R&D, innovation, inventions, technology, etc. Poland has multiplied its investment in R&D from GDP (SDG_09_10, below the EU), so human capital in science and technology (SDG_09_21, EU level) and the number of patents filed with the European Patent Office (SDG_09_40) have increased.

Eliminating inequality SDG 10 (*Reduced Inequalities*) is an important issue of modern times, both between states and within a state. Poland skilfully uses the tools for inequality elimination (SDG_10_10, below the EU), poverty risk elimination (SDG_10_30, better than the EU), proper income distribution (SDG_10_41, better than the EU). Serbia is making a progress, but it is still below the EU average. SDG 11 (*Sustainable Cities and Communities*) includes the issues of social life. Poland has made a significant progress in recycling municipal waste, which is generated by households in cities, so the index has significantly increased (SDG_11_60, below the EU); however, the rule of law and respect for human rights is unacceptably low - public reporting of crime, violence or vandalism (SDG_16_20, below the EU). In Serbia, waste recycling is insufficiently included in the system, both due to the self-awareness of individuals and insufficient investment capacity to start the production chains for recycling. As for the rule of law and human rights, Serbia has improved its image in Europe, although the reporting has declined in recent years. Economic wealth implies a responsible corporate sector, sustainable consumption and production, with efficient use of resources and the preservation of the environment (SDG 12 - *Responsible Consumption and Production*). Waste generation in Poland poses a direct threat to the sustainability of a healthy environment (SDG_12_50, above EU). Serbia, like Poland, produces a lot of waste.

Democratic institutions, respect for human rights and the rule of law (SDG 16 - *Peace, Justice, and Strong Institutions*) are crucial for the further development of society. Poland has significantly improved and strengthened the institutions of the system, so individuals can rely on objectivity and legality in proceedings (SDG_16_10, EU level), reaching the EU average. Serbia has improved this development component in recent years.

The remaining four objectives (SDG 13 - *Climate Action*, SDG 14 - *Life below Water*, SDG 15 - *Life and Land*, SDG 17 - *Partnerships*) were not analysed, individually by indicators, due to

the unavailability of the data for Serbia, so it was not possible to conduct a comparative analysis.

Concluding remarks

The importance of SDG to the global economy has proved to be immense. Majority of countries have successfully implemented the measures and activities that lead to sustainable development, but there are also a few with poor results. For Serbia, the 2030 Agenda is a challenge because it provides an opportunity to ask key questions - What should Serbia look like in 2030? How much initiative and engagement is needed to reach the desired level of the society in 2030? How to achieve it? The advantage for Serbia, in terms of achieving the set SDGs, is that numerous goals have already been established through the EU accession process. Therefore, this should be taken advantage fo, together with the experience of Poland. Poland has already paved the way for the sustainable development of its state and society. With a responsible approach, Poland will continue to make a progress in the realization of SDGs in the forthcoming period.

The analysis of SDGs in the EU, Poland and Serbia displayed that the set EU standards of sustainable development are currently unattainable for Serbia. On the other hand, Poland is more successful. Poland has reduced the gap compared to the EU average since the moment of membership and has successfully improved the policy of sustainable development, which resulted in better values of the indicators. It is necessary for Serbia to improve the realization of the set goals defined in the action plan. The comprehensive implementation of a set of measures within the system is needed, and the best way is to use the experiences of EU member states that are making a significant progress in sustainable development indicators, such as Poland.

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Determination of structural changes efficiency in the economic system of the region in the context of implementation the Concept of Sustainable Development

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Abstract: The paper presents the results of scientific research to address the issue of assessing the effectiveness of structural changes in the regional economic system that take place in the context of the practical implementation of the basic principles of the Concept of Sustainable Development in Ukraine. Based on the analysis of literature sources on the profile of the research, the proposed use of the program method for the formation of strategic plans for regional development on the basis of effective functioning of system-forming both in relation to the regional economic system and for the national economy as a whole. And long-term development programs and the main tasks of such development are defined. It is proposed to introduce a system of constant monitoring of certain components of the principles of sustainable development of the regions of Ukraine, scientific circulation is recommended to be supplemented by the economic category of the effectiveness of structural changes, its characteristics are given. To assess the effectiveness of structural changes at the regional level, taking into account the requirements of sustainable long-term development, it is proposed to use an index assessment method, in particular, an aggregate index of development efficiency.

Keywords: sustainable development, region, efficiency, structural change, concept.

JEL: O18, R11, R13

Introduction

The last quarter of the XX century and the beginning of the XXI have been marked in the world economic history by the processes of formation and implementation in the practice of social development and economic activity of the main provisions of the Concept of Sustainable Development [HRYSHYN Y., 2007].

The basis of this concept is the solution of a threefold task, namely to ensure sustainable harmonious development of the economy, ecology and society of regions, countries and civilization in general in the long run.

It is the implementation of the basic principles of the Concept of Sustainable Development that prompted the rulers, business leaders and society as a whole to understand the solution to problems and tasks of further development of civilization from the standpoint of unity of existence in a single geopolitical space.

The coronavirus epidemic, which spread all over the world almost a year ago, was a clear confirmation of the unity of problems, tasks, and the search for ways to solve them in the globalized world.

The epidemic emphasized that in the world, with its comprehensive processes of globalization, there are no separate problems, continents, countries or regions [DROBYAZKO, HILORME, SOLOKHA & BIELIAKOVA, 2020]. According to the research [VERNADSKYI V., 2004], we fully share the scientific opinion on the development of the noosphere, civilization develops according to certain laws, principles and principles of their implementation, regardless of the geopolitical positioning of countries and their individual territories on the world map.

Extensive mechanism of development of industrial production systems and their complexes in the second half of the twentieth century prompted scientists, industrial owners and government officials at various levels to find fundamentally new ways to transform technological systems to move from one way to another - higher.

The solution of these problems is possible only under the conditions of transition to intensive functioning and development of production, to provide its effective restructuring starting from the enterprises of regional level and to the world scale on the basis of realization of provisions and tasks of the Concept of sustainable development. Therefore, the chosen topic of research, the main results of which are presented in this article is quite timely and relevant.

Theoretical prerequisites for effective changes in the production regional structure

Ukraine, as a sovereign state immediately after gaining independence, acted as a signatory to the Concept of Sustainable Development, and at the same time, as a full participant in the international market of goods and services, and a successful participant in globalization.

According to economists-historians [LAZAROVYCH & LANOVYK, 2003], at the time of gaining independence – August 1991, Ukraine had the most depreciated fixed assets and depleted natural resources, with 15 countries that emerged in the post-Soviet space, the situation with other productive resources was unsuccessful.

In Ukraine and its regions, there was a lack of financial resources, there were no models and mechanisms for attracting investment resources (both internal and external) in the real sector of the economy, the researchers argue [MAROVA, TOKAREVA, SOLOKHA, NOGA & TURBINA, 2019].

Thus, the regions and their system-forming enterprises faced the problem of developing strategies for effective management of restructuring of economic systems, determining the main factors influencing these processes and their effectiveness in the long run on the basis of the Concept of Sustainable Development [DROBYAZKO, OKULICH-KAZARIN, ROGOVYI, GOLTVENKO & MAROVA, 2019].

Restructuring of regional economic systems requires a certain model on the one hand, assessment of its effectiveness, on the other there is a need at the present stage of transformation of socio-economic relations at the regional level to strengthen social responsibility of business structures as one of the requirements for sustainable development in strategic perspective [BREUS, SOLOKHA, BIELIAKOVA, DERII, DIELINI & 2020].

Leading modern scientists have devoted their scientific works to the task of restructuring regional economic systems, ensuring their sustainable development in the strategic perspective and assessing the effectiveness of such development. The above encourages the deepening and expansion of the horizons of further scientific research.

The scientific developments of the above scientists have formed the theoretical and methodological basis of our study and once again prove its timeliness and feasibility.

The research, the main results of which are presented in this article, is an integral part of the research work of the Donetsk State University of Management of the Ministry of Education and Science of Ukraine and the Azov Maritime Institute of the National University “Odessa Maritime Academy” of the Ministry of Education and Science of Ukraine: “Reasons for imperatives of innovative providing of the region” (0115U000561); “Formation of theoretical and methodological foundations for the economic development of the region and its evaluation in the strategic perspective” (0115U006581).

Methodology

The methodological basis of this study were both general and special approaches to the organization and conduct of scientific research, as well as scientific development and

generalization of leading domestic and foreign scientists of today. The purpose of the study is to determine the theoretical prerequisites and the formation of practical recommendations for the effectiveness of structural changes in the economic system of the region in the context of the implementation of the Concept of Sustainable Development in Ukraine.

Program approach and monitoring of sustainability of development of regions of Ukraine

To implement the provisions of the Concept of Sustainable Development at the regional level and at the level of the country as a whole, a software method of solving development problems is needed, as evidenced by the authors [BREUS, SOLOKHA, BIELIAKOVA, DERII, DIELINI, 2020], that the basic industries of the region, as well as some old industrial regions of Ukraine are most vulnerable to depressive processes and need a radical restructuring, the main purpose of which is to define and implement a system of measures to ensure not only crisis prevention and stabilization of individual industrial enterprises conditions for effective sustainable regional development in the long run.

The process of integration of all parameters of development of industrial regions involves solving problems of different levels. In relation to the program-targeted solution of the problems of effective sustainable development at the regional level of government, the main efforts should be directed not so much to the creation of new development programs, but to assessing the effectiveness of the existing ones, their necessary adjustment and development of a monitoring system.

As obligatory stages of this process, we suggest to allocate the following – maintenance of coherence of regional development programs with branch, possibility of modification in connection with limited resources and with specification of priority of program actions, necessity of change of territorial proportions in distribution of means for realization of development programs.

The practice of managing the implementation of programs (organization of management, forms of implementation, interaction with regional and local authorities, etc.) also requires significant improvement on the basis of the experience gained now.

In this regard, when developing a mechanism for strategic management of sustainable development, it is necessary, firstly, to determine what specific measures should be taken in the economic space of the region in the first place, and secondly, to create conditions

for optimal combination of state and market regulation of the effectiveness of sustainable development.

It should be noted that the main feature of the existing programs of long-term sustainable development of the regions of Ukraine is the development and justification of investment projects, the implementation of which requires production resources in certain, quite significant amounts, as evidenced by scientists [ZHOLONKO, GREBINCHUK, BIELIKOVA, KULYNYCH & OVIECHKINA, 2021].

Obtaining additional resources for the medium in the long term for the implementation of investment programs (in fact, these are existing programs for the development of specific enterprises) in conditions of limited financial resources is a difficult practical task, especially for large industrial enterprises, because the state budget can provide only part of the financial needs and resources.

The current system of monitoring and development of medium- and long-term forecasts, concepts and programs of sustainable socio-economic development creates more favorable conditions for linking regional programs with national parameters, and, most importantly, for more realistic linking of projected needs with resources for their pleasure [BREUS, SOLOKHA, BIELIAKOVA, DERII & DIELINI, 2020]. At the same time, there are extra-budgetary sources of funding.

The best solution is to achieve a situation in which the implementation of programs (after a certain initial period, when you need to attract investment) creates sources of accumulation of investment resources for further development of the program.

In order to assess the effectiveness of existing development programs, the formation of components of the strategy of integrated growth of industrial enterprises in the region, optimization of financial flows for specific development goals, it is proposed to use the following sequence of coordination functions at the regional level of long-term sustainable development:

- identification of measures implemented through sectoral, regional programs and development programs of specific industrial enterprises and concentration (“collection”) of financial resources of all programs to address key issues;
- identification of the most significant financial sources of regional development throughout the system of development programs;

- coordination of the implementation of all programs as a single system of activities in a particular area;
- justification for the formation of the necessary additional regulatory framework for the development of the region ("framework" conditions) for a specific period of time;
- forecasting markets for products produced in the region;
- coordination of actions of regional authorities and local governments;
- selection of stages of development of regions with definition of methods and ways on how to make decisions on them, or the problems at each individual stage.

The implementation of targeted programs depends on the validity and effectiveness of operational decisions made on the basis of analysis of the implementation of program activities. In this regard, it is necessary to organize effective monitoring of implemented programs at the regional level.

The purpose of the proposed monitoring system should be regular monitoring and forecasting of the impact of changes in the functioning and development of industries and individual enterprises on the economic situation in the region, which, in turn, will allow to make the necessary management decisions in both economic and social spheres, to the provisions of the Concept of Sustainable Development.

This approach will increase the efficiency of managing the implementation of programs aimed at solving strategic development problems, taking into account the social and economic consequences.

Monitoring the implementation of development programs should show the degree of impact of these programs on changes in the socio-economic situation in the region, the effectiveness of program measures, the adequacy of methods and forms of implementation of socio-economic, natural and other features. Based on this, the main functions of the proposed monitoring system should be:

- collection and statistical processing of information on the implementation of development programs in the region;
- control over the implementation of program measures and their financial support with the allocation of industrial complexes and specific industrial enterprises in terms of individual areas of the region;

- coordination of measures of regional programs with the state forecasts of social and economic development and investment programs of concrete enterprises;
- coordination and reciprocity of the carried out program actions of programs of various function;
- preparation of information and analytical materials to substantiate the sequence of program activities and the list of programs proposed for funding in the next period;
- preparation of the regional section of the target programs which are included for financing in the project of the state budget.

The proposed system of monitoring regional programs of sustainable long-term development will contribute to solving such problems as clarifying the place of regions in the new system of interregional division, formed in the deepening of territorial and administrative reform, work in the country, more complete reflection of regional features. adjustment and coordination of programs implemented in the regions in order to maximize the effectiveness of regional development in the long run.

Evaluating the effectiveness of structural changes at the regional level.

The effectiveness of the strategy of integrated growth at the level of industrial enterprises is directly related to the structural transformations that are needed not only in the national economy, but also (perhaps even more) in each individual region of Ukraine.

Uncertainty of the basic concept of the effectiveness of structural change requires the introduction of a new term, “functional efficiency of development”, which can be understood as a set of effectiveness of specific methods and techniques aimed at structural change and directly dependent on certain management functions of regional development.

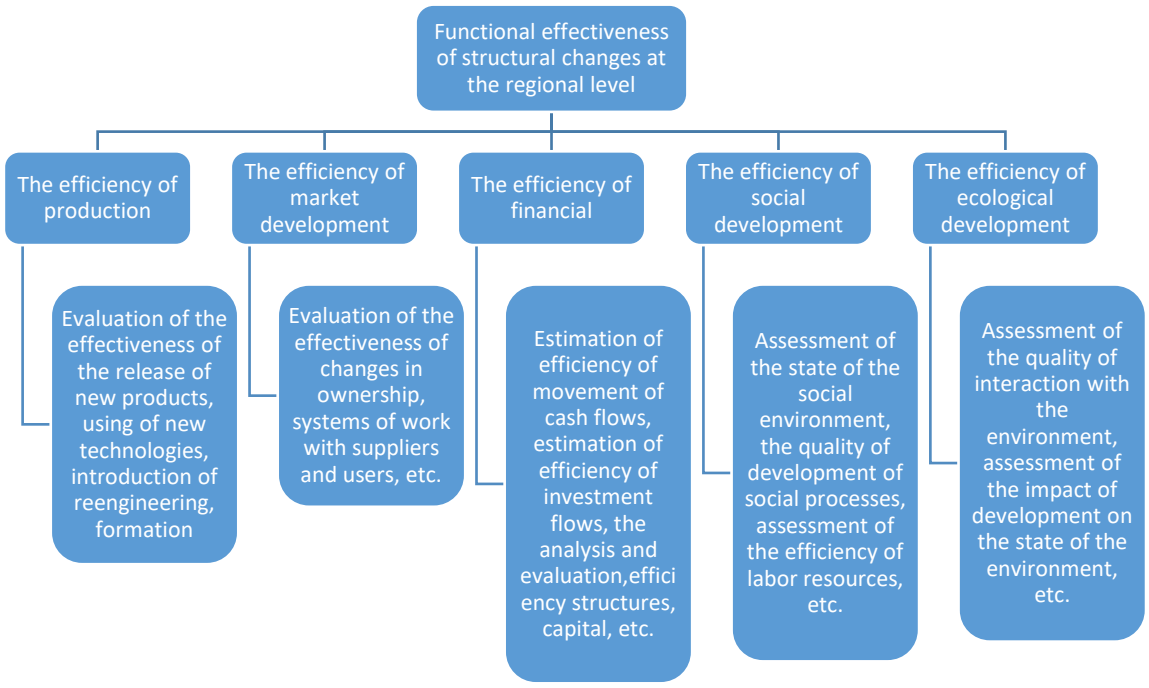
Any function or set of functions of the socio-economic system should be subject to structural changes in this case. Thus, the functional effectiveness of structural changes can be assessed by comparing the costs and results associated with the implementation of certain structural changes within the organization, aimed at achieving the optimal balance between the effectiveness of the organization and the stability of its position in the regional context.

This process is associated with the allocation of such key areas for assessing the effectiveness of regional development as the effectiveness of industrial, market, financial, social and environmental development. Accordingly, it is advisable to identify the following types of functional efficiency of structural changes (Fig. 1).

Next, we highlight and explore in more detail the following types of functional effectiveness of structural changes at the regional level:

- efficiency of production changes or production development (assessment of the effectiveness of the transition to the production of new products, the transition to a new production technology, a radical change in production activities);
- efficiency of market development (assessment of the effectiveness of changes in the form of ownership, the system of work with suppliers and consumers);
- efficiency of financial development (assessment of the efficiency of cash flows, assessment of the efficiency of investment flows, analysis and assessment of the effectiveness of capital structure, etc.);
- efficiency of social development (assessment of the state of the social environment, quality of development of social processes, assessment of the efficiency of labor resources, etc.);

Figure 1. Types of functional efficiency of structural changes at the regional level



Source: own work

- efficiency of ecological development (assessment of the quality of interaction with the environment, assessment of the impact of development on the state of the environment, etc.).

The analysis of efficiency of structural changes and, accordingly, possibilities of long-term development on the named functional groups allows to define preconditions and conditions of effective regional development in strategic perspective taking into account features of a concrete region and the requirements of the Concept of sustainable development.

The selected elements are the main ones, because they form the development process and are system-creating for it. At the same time, structural changes affect not only the elements of the system, but also internal system relations – development management (according to management levels - national development management, regional development management, development management at the level of industrial systems, enterprises), development strategy, interaction between different levels of government, etc. Thus, it is necessary to evaluate the effectiveness of internal systemic structural changes.

The efficiency of production changes, or production development, is directly related to the introduction of production innovations, technological structural changes.

These include:

- production of completely new products at old or newly created facilities. Many enterprises in the region, which found themselves in a state of crisis, tried to find their niche through radical industrial transformations;
- strengthening of competitive positions on the basis of introduction of reengineering or modernization of business, release of production unique for a separate region (and the country as a whole);
- formation of technological clusters, which involves the integration of different enterprises within one production complex into a single structure in order to create a continuous technological chain for the production and sale of any type of product.

At the same time, as a rule, it is possible to reduce the cost of production (including those consumed at different stages of the process), accelerate its implementation, vary as needed its quality and technical characteristics, as well as normalize cash flow between organizations in the technological chain.

The effectiveness of financial development is assessed on the basis of the state of incoming and outgoing cash flows. At the enterprise level, it is reflected in the balance sheet, in terms of its articles. Therefore, the effectiveness of financial change is assessed in the following blocks:

- efficiency of use of enterprise assets;
- efficiency of use of liabilities of the enterprise.

In assessing the effectiveness of the use of assets, of particular importance for enterprises are the management of structural changes in the composition of assets out of circulation and receivables.

These changes are usually a maximum reduction in the share of non-profit or low-income assets in their total structure. The reduction primarily includes objects of the socio-cultural sphere (kindergartens, community centers, health facilities, etc.), which were previously listed on the balance of large enterprises.

The efficiency of the use of liabilities for industrial enterprises is associated with structural changes in the composition of equity and accounts payable. A change in the structure of owners is not only a strengthening of the positions of certain parties at the expense of others, but a change of owners in general.

Changes in the composition of accounts payable are aimed at overcoming the crisis related to debts that have accumulated during the crisis of the enterprise.

Ways to overcome such situations may not be entirely correct, because they involve either the “freezing” of part or all of the debt, or such a way of financial recovery, in which debtor companies create new companies, not burdened with obligations, and the “old” enterprise remains the formal defendant in a generally hopeless obligation.

It is quite difficult to formalize the assessment of the effectiveness of market and intra-systemic changes. The object in these cases is the form of ownership of the enterprise, the type of economic activity (work according to certain schemes), the management system of the enterprise (for example, a comprehensive information system).

The social and ecological functional efficiency of the development of industrial enterprises is the most difficult in terms of their assessment. The reason is that their implementation has the main purpose of stabilizing (both internal and external) organizations, and therefore can not count on an increase in profits in the short term. As the vast majority of enterprises are concerned with resolving current financial issues while completely ignoring

the problems of strategic development, social and environmental factors are practically not considered by them today.

Managers and owners of enterprises pursuing strategic goals can succeed only by increasing a particular type (or set of types) of functional efficiency, depending on the objectives.

To assess these types of efficiency and, based on the strategic approach to the need to integrate all components of industrial development, we propose to use the following aggregate efficiency index of industrial development:

$I_{id} = I_{fpe*} I_{ffe*} I_{fme*} I_{фвэ*} I_{fse*} I_{fee}$,

where I_{fpe} – index of functional production efficiency;

I_{ffe} – index of functional financial efficiency;

I_{fme} – index of functional market efficiency;

I_{fise} - index of functional internal system efficiency;

I_{fse} – index of functional social efficiency;

I_{fee} – index of functional ecological efficiency.

The value of each index is defined as the ratio of indicators for the current and base periods, respectively. Given that each of the selected types of efficiency is a complex value, for their calculation it is advisable to use the method of Academician [AMOSHA O., 2002], according to which it is formalized as follows:

$$E = \sum_{i=1}^{n} E_i \pm \sum_{i=1}^{n} E_{ni}$$

where Ei – efficiency obtained due to the i-th factor of production, technical, organizational or social nature;

Eni – efficiency obtained due to the socio-psychological factor due to the i-th factor of production, technical, organizational or social nature;

n – number of factors.

Each of the components of the indices with its quantitative value indicates the positivity or negativity of change. If the changes are positive, the value of the index will be greater than one, if the changes are negative, their value will be less than one. The product of these indices will be an integrated assessment of changes caused by the total of all selected components.

It should be noted that the proposed index of assessing the effectiveness of structural changes at the regional level covers a wide range of its constituent elements, but can not fully assess all the effects of development and the different direction of the whole range of growth factors in the long run.

According to scientists [MAKSYMOV V., 2000; PYSMAK V., 2000], regional development depends on a more complex system of interdependent factors, among which territorial location and highly qualified personnel play an important, but not exclusive role. In addition, neither the sectoral structure nor the availability of new high-tech industries fully determine the economic growth of industrial enterprises in the region.

A comprehensive system approach to assessing the effectiveness of integrated growth of system-forming industrial enterprises in the region requires the study of cluster theory and development based on a strategy of sustainable regional development within specific territorial economic complexes based on the Concept of Sustainable Development.

Conclusions and recommendations

Having studied the main theoretical and methodological provisions for assessing the effectiveness of structural changes at the regional level, taking into account the principles of the Concept of Sustainable Development, we can make some generalizations and conclusions.

Traditional methods of determining the effectiveness of the development of system-forming enterprises at the regional level, primarily the number of products that reflect the increase and services, do not allow to fully assess the actual and projected changes in the chain of increasing effects from existing technologies and new products, first of all, to save resources and individualize both production and consumption.

The effectiveness of the proposed strategy of integrated industrial growth involves radical modernization of the production apparatus of traditional system-forming industries based on the latest technology, resulting in supplies to other industries transferred part of the economic effect obtained in basic industries, i.e., somewhat improved structural proportions.

Implementation of the strategy of integrated growth of industry in the region requires a software method of solving development problems in the long run, because the basic industries, as well as individual areas, are most vulnerable to depressive processes and need

structural adjustment, the main purpose of which is to define and implement a crisis system and the formation of an efficient economy.

The effectiveness of the strategy of integrated long-term sustainable growth is expressed through the level of achievement of economic and social development goals and is the sum of economic, scientific and technical, social and environmental effects.

Uncertainty of the basic concept of the effectiveness of structural change requires the introduction into scientific circulation of a new term, "functional efficiency of development", which can be understood as a set of effectiveness of specific methods and techniques aimed at structural change and directly dependent on certain management functions.

Further research to assess the effectiveness of structural changes in the economic system of the regional level should focus on practical testing of theoretical and methodological results obtained at this stage of scientific research, the formation of an appropriate analytical basis based on monitoring the regional development.

The next stage should be the development of a multifactor multivariate economic-mathematical model for evaluating the results and making forecasts of the level of efficiency of regional development in the long run on the basis of the Concept of Sustainable Development.

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Assessment of the impact of budget decentralization on sustainable development of territorial communities in Ukraine

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Abstract: Peculiarities of territorial community (hromada) development management are revealed and theoretical approaches to budget decentralization in Ukraine are substantiated. Based on the analysis of the composition and structure of local budget revenues, as well as the calculation of indicators of financial independence of territorial communities (hromadas), it is proved that the modern budget system of Ukraine is characterized by a high degree of centralization of budget resources, which does not provide real independence. To build an effective and efficient model of budget decentralization is to determine the tax potential of a separate administrative-territorial unit (territorial community). For further success of decentralization, it is necessary to determine the optimal scope of state functions, which are expedient and cost-effective to delegate to the appropriate local level on a permanent basis, thus translating them into their own functions of local governments.

Key words: budget decentralization, community (hromada), amalgamated hromadas, sustainable development, hromada financial support, financial security.

JEL: G28, H30, H41, H50, H72, H77, R12.

Introduction

In modern conditions, the global trend in public finance and public construction is to strengthen the institution of local self-government and strengthen its influence on social, economic and political processes in society. Ongoing reforms in Ukraine to decentralize power and strengthen the financial independence of local governments require an assessment of their effectiveness and efficiency in achieving these goals and long-term priorities.

Socio-economic development of the regions of Ukraine in terms of integration with the European Union is modernized by introducing budget decentralization and giving greater independence to local governments in addressing issues of their competence in accordance with European requirements. The reasons for the reforms are: low level of financial

independence and economic and financial security of territorial communities (hromadas), disproportionate distribution and redistribution of funds between the state and regions, imperfect management of the formation and use of financial resources by territory. This leads to a slowdown in the balanced development of the regions of Ukraine, which is particularly reflected in the dynamics of indicators of hromadas' development, which are the main actors of socio-economic development of regions and the country as a whole.

Budget redistribution, which is accompanied by horizontal unification of hromadas throughout Ukraine, requires the development of an effective strategy to improve the financial situation in the country through the use of promising modernized instruments of state regulation of the economy. It should be noted that the process of hromadas' amalgamation should be in the interests of citizens, not just the state, thus ensuring positive changes in financial security indicators.

Methodology

The research is theoretical and cognitive in nature and contains an analytical part. The authors use critical analysis of the subject literature, meta-analysis, deductive and inductive reasoning, as well as a comparative analysis using elements of time series analysis (analysis of dynamics and structure changes). Due to objective obstacles in carrying out a quantitative analysis, the assessment is qualitative in nature, with elements of inductive reasoning.

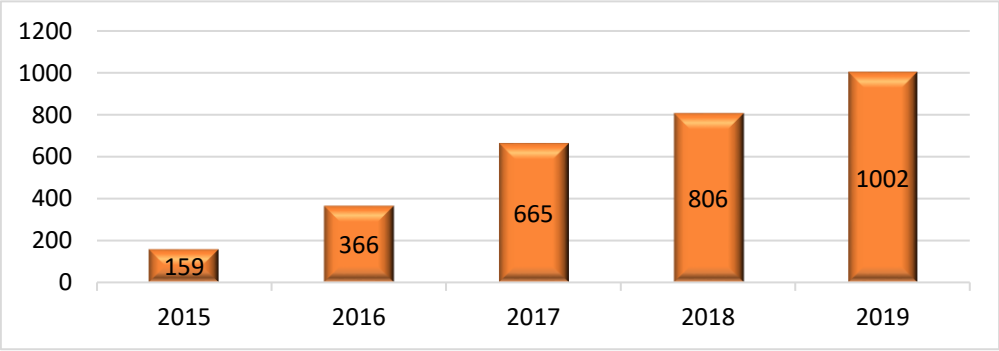
The analysis of recent publications on regional development, budget support of territorial communities and the formation of regional research methodology was carried out by scientists, in particular: D. Palma, G. Richardson, F. Perrault, M. Storper, R. Walker, B. Burkinsky, Z. Gerasymchuk, V. Chuzhikov and others. Methodological problems of socio-economic development of regions in the context of decentralization are reflected in the works of such foreign scientists as: A. Alcian, R. Barro, T. Veblen, E. Zolta, R. Coase, R. Musgrave, W. Oates, D Romer, R. Solow, C. Tibou. The works of Z. Varnaliy, T. Bondaruk, B. Danylyshyn, V. Kravtsiv, M. Melnyk, V. Miklovdy, and I. Storonyanska are devoted to the issue of solving the problems of improving the regional policy of socio-economic development of regions in the context of decentralization and administrative-territorial reform, O. Tishchenko, M. Khvesika, S. Schultz, etc.

Decentralization as a one of the key reforms to create capable territorial communities (hromadas) in Ukraine

The process of hromadas' amalgamation in Ukraine began in 2014 due to the relevant amendments to the Tax and Budget Codes of Ukraine, which in 2015 allowed to demonstrate the first positive changes in the development of territorial communities as a result of their financial resources increasing. The way to implement decentralization is a very complex and long process to achieve a high level of economic development. There are many problems and acute moments on this path of implementation that seem strange to the population, but they are effective in the European value system. It is impossible to copy everything, as in the EU, but we must always remember that when choosing one's own model of socio-economic development, one needs to be more delicate and prudent.

The chronology of hromadas' amalgamation for 2015-2019 is as follows (Fig. 1). In 2015, their number was 159 amalgamated hromadas (AHs), in 2016 – 366 AHs, in 2017 – 665 AHs, in 2018 – 806 AHs, with each passing year the indicators increased. As of the end of 2019, there are already 1002, which includes 490 districts, indicating a significant breakthrough in the development of territorial communities (hromadas). Because budget funds are spent not only on the welfare of the state as a whole, but also directly on the welfare and development of a large number of them.

Figure 1. Number of Amalgamated hromadas

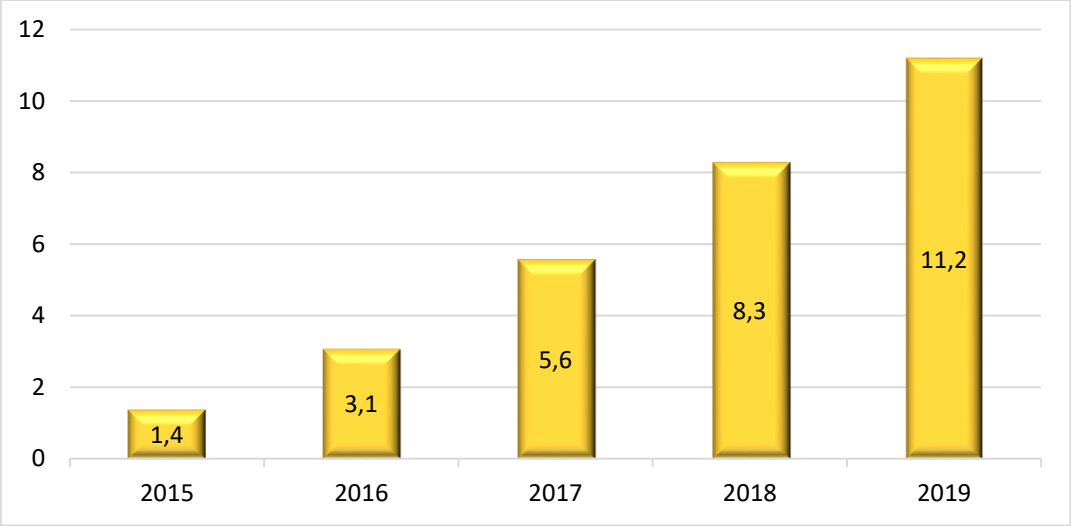


Source: own work based on https://decentralization.gov.ua

Considering the dynamics of the number of inhabitants (Fig. 2), we can see that in 2015, there were 159 AHs accounted for 1.4 million people, the number of AHs grew and the population increased in this area, in 2019, 11, 2 million people lived in 112 AHs. This indicates

that not all the population of Ukraine moves to cities or abroad for a better life, and with the development of their locality, they can work on their native land.

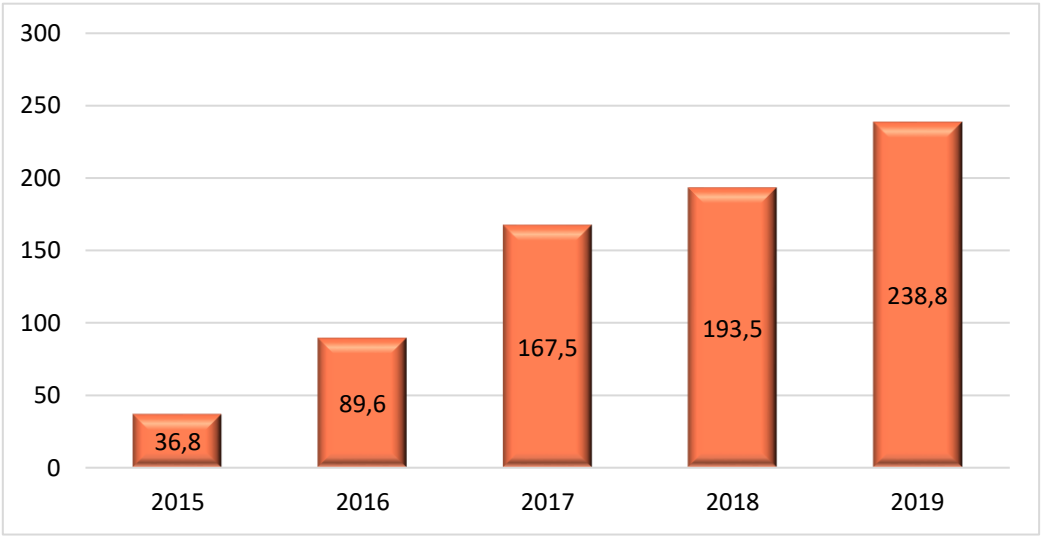
Figure 2. Number of inhabitants in amalgamated hromadas



Source: own work based on https://decentralization.gov.ua

The dynamics of area indicators also increased (Fig. 3), in 2015 it amounted to 36.8 thousand square. km. of the total area of the country, in 2016 - 89.6 thousand square km., 2017 - 167.5 thousand square km., 2018 - 193.5 thousand square km., and today it is as much as 238.8 thousand square km.

Figure 3. Area of amalgamated hromadas (thousand square km)



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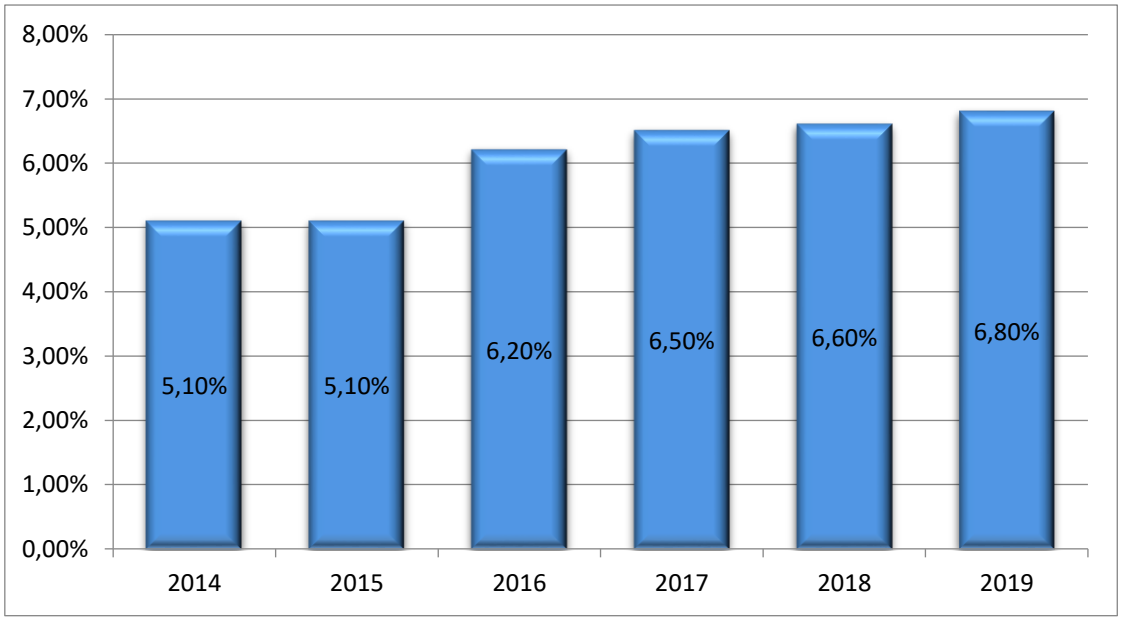
Local budget development trends for the period from 2014 to 2019 in Ukraine

Based on the results of the monitoring process of decentralization of power and reform of local self-government, we will analyze the dynamics of local budget indicators and determine the trend of change for the period from 2014 to 2019.

Due to the expansion of the revenue base of local budgets, emerging and increasing shares in gross domestic product (GDP), the share of own revenues of local budgets (general fund) to GDP in % (Fig. 4) increased rapidly, during the period from 2015 to 2016 by 1.1%, and in other years increased slightly and decreased every year by 0.1% from 0, 3%, but stable growth is already progress.

Figure 4. Share of local budgets' own revenues (general fund) in GDP, in %



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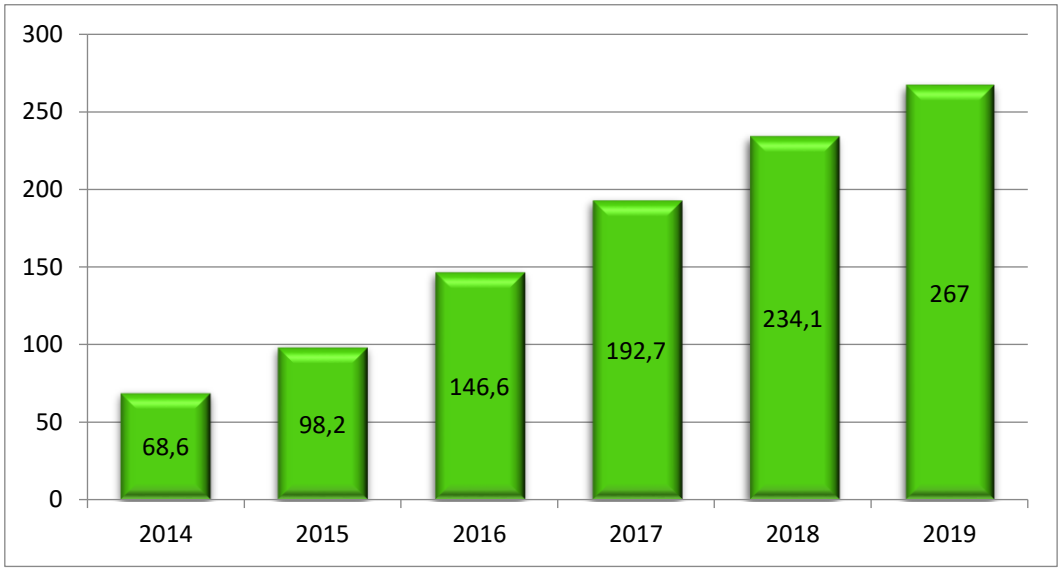
Own revenues of the local budgets' general fund (Fig. 5) also tend to increase. From 2015 to 2016, the growth was by UAH 48.4 billion, and from 2018 to 2019, the growth decreased to UAH 32.9 billion, which is not an unsatisfactory indicator, the main thing is that this growth trend works. That is, local authorities have sufficient financial resources to use effectively for community development.

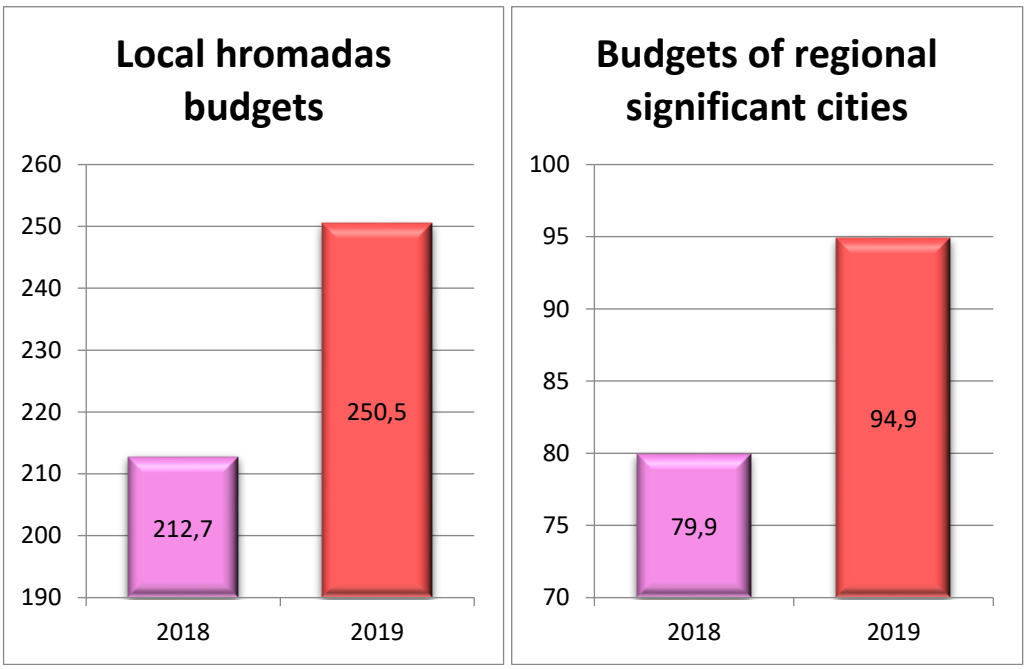
Figure 5. Own revenues of the local budgets' general fund, UAH billion



Source: own work based on https://decentralization.gov.ua

Analyzing the implementation of the local budgets own revenues for January-November, 2019, compared to January-November, 2018 (Fig. 6), we see that there was an increase of 18-19%, namely by UAH 37.8 billion in the local budget, and in the budgets of the regionally significant cities by UAH 15 billion. We believe that this is a significant progress in development, although in 2019, prices continued to rise with low official inflation in the country, but the competent distribution of funds provided for in the reform of decentralization of territorial communities (hromadas) shows a positive trend in territorial development. Thus, by increasing the revenues of local budgets and increasing budget funding, it is possible to stimulate the development of infrastructure and more fully meet the needs of local communities (hromadas).

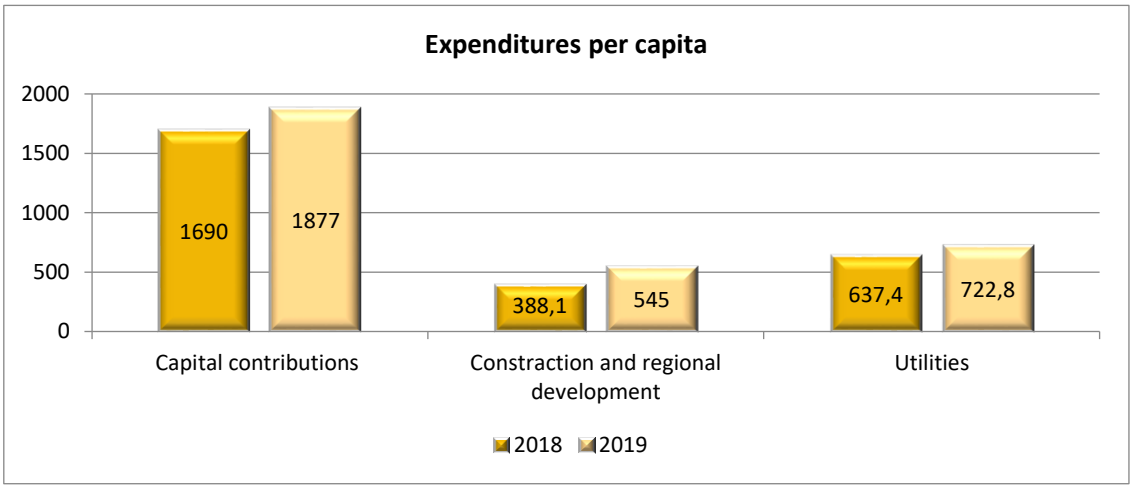
Figure 6. Execution of local budgets' own revenues, UAH billion (%)



Source: own work based on https://decentralization.gov.ua

Considering the distribution of local budget expenditures per capita (Fig. 7), when comparing the years 2018 and 2019, it was found that the main components of the distribution are: capital expenditures (by 11.1% increase), construction and regional development (by 40, 4% increase), housing and communal services (by 13.3% increase).

Figure 7. Dynamics of local budget expenditures for 2018-2019

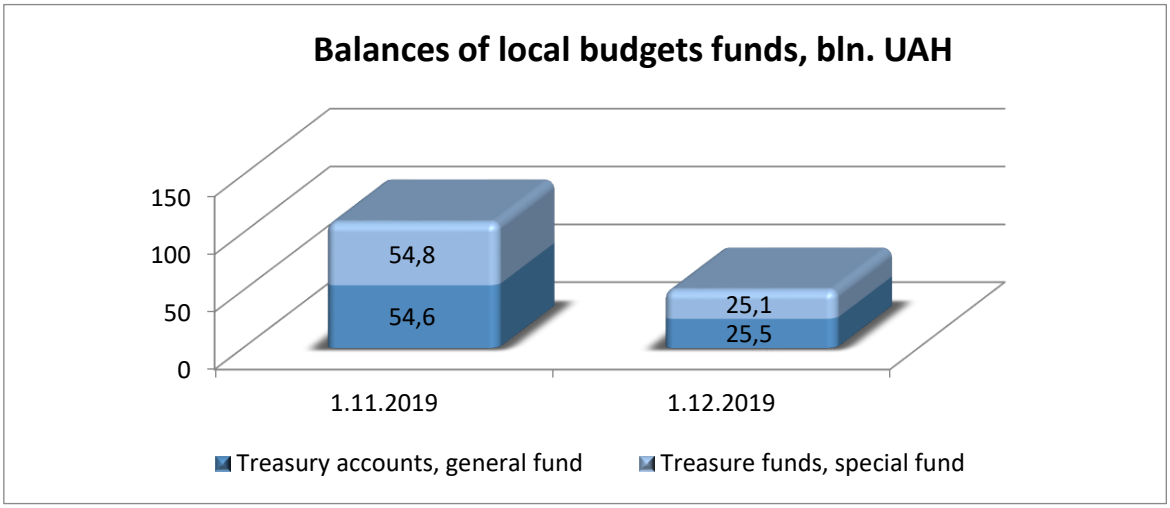


Source: own work based on https://decentralization.gov.ua

As evidenced by the data in Fig. 8, even with the existing revenues and expenditures of local budgets, there is a balance. This indicates that the data on the financial capacity

of amalgamated hromadas are trying to make it as transparent as possible and show that there is a balance on the accounts. Balances of local budgets of Ukraine (Fig. 8) decreased in the period from 11/1/2019 to 12/1/2019 twofold.

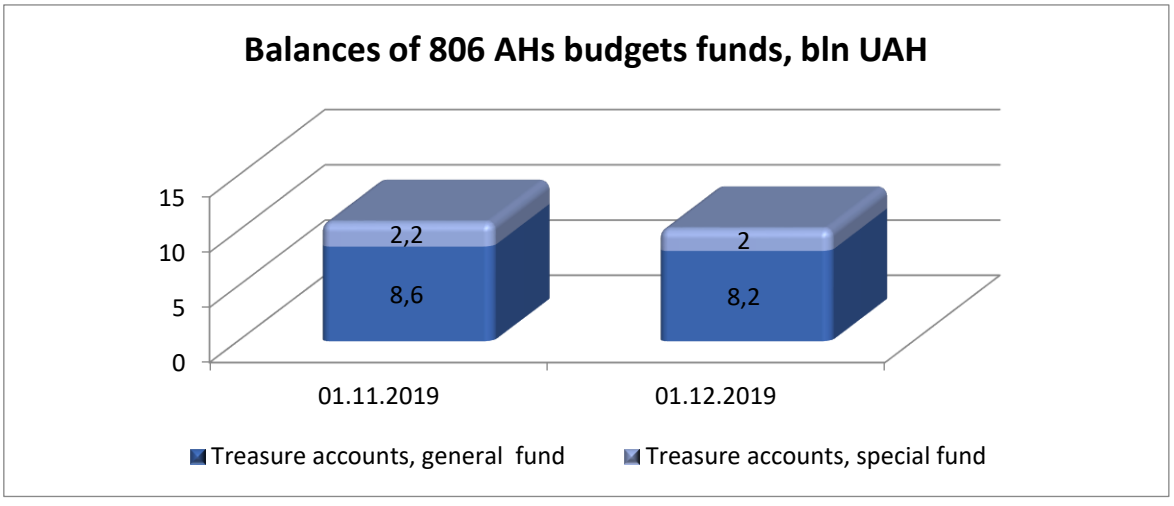
Figure 8. Balances of local budgets funds, bln UAH



Source: own work based on https://decentralization.gov.ua

At the same time, the balances of 806 amalgamated hromadas (Fig. 9) decreased slightly, by UAH 0.4 billion.

Figure 9. Balances of 806 amalgamated hromadas budgets funds, bln UAH



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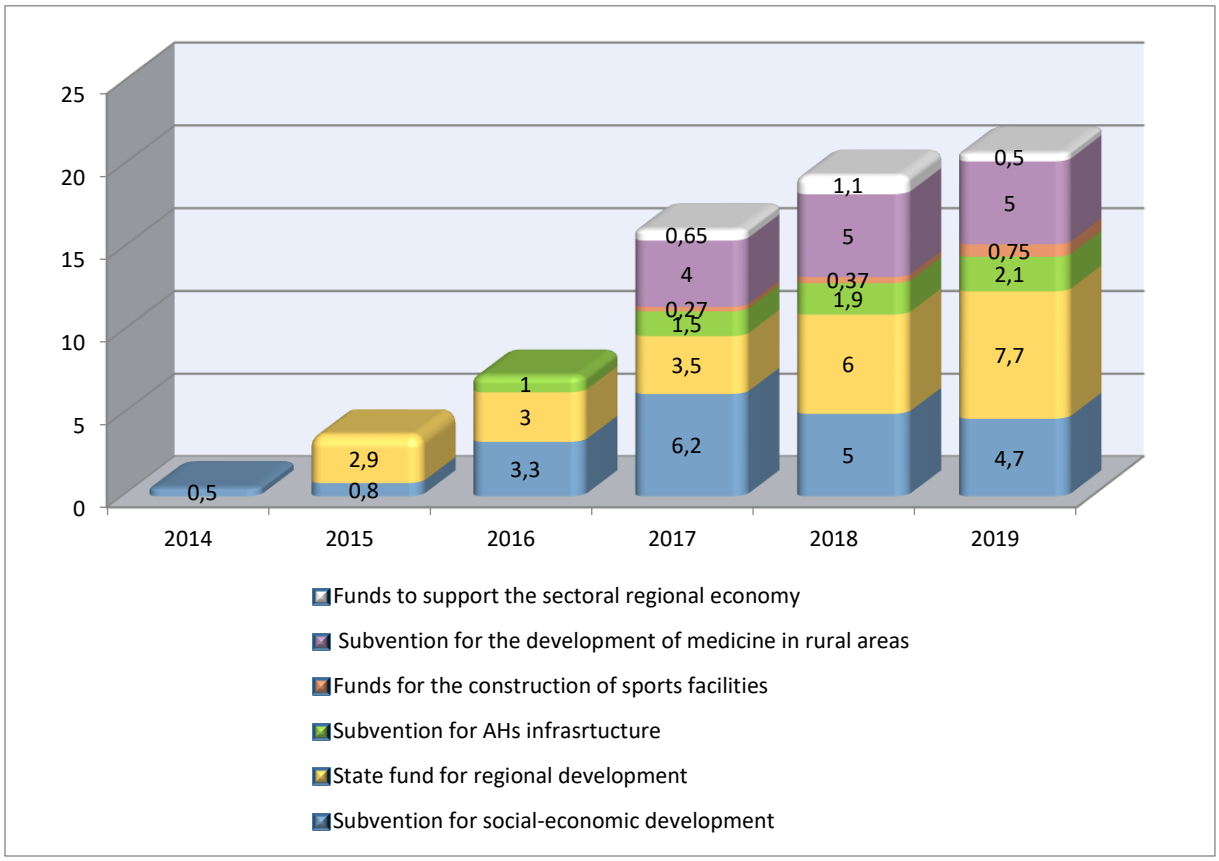
Thus, it can be assumed that the funds for the needs of the population and the support of the hromada are too much, but this is a false assumption. In fact, there is a mismatch between the expenditures of each period for the same needs, so balance is formed.

As for the volume of state support to territorial communities (hromadas), as evidenced by the indicators, the state has increased the amount of financial support to AHs (Fig. 10). Thus, if in 2014 support for socio-economic development amounted to UAH 0.5 billion, then in 2018, the amount of support funds amounted to UAH 19.37 billion, and in 2019 - UAH 20.75 billion, or 41 times more than in 2014.

Figure 10. State financial support of local and regional development, UAH billion



Source: own work based on https://decentralization.gov.ua

With regard to the amount of state aid to regions in support of socio-economic development, a rating of state financial support for local and regional development, in every 24 regions (excluding the Autonomous Republic of Crimea). The first 5 oblasts are: Donetsk - UAH 1,064 million, Lviv - UAH 907 million, Dnipropetrovsk - UAH 881.1 million, Odesa - UAH 809.4 million, Ivano-Frankivsk - UAH 738.7 million. These funds supplement the local budget and are designed to improve and renew the infrastructure of the local community. Particular attention is paid to the Donetsk region, as there are military operations and the local community needs more help.

To meet a certain level of territorial security needs, a clear list of priorities and tasks is calculated, in order to avoid threats of loss of financial resources that may arise in the process of implementation of tasks. The search for ways to increase financial resources is for local governments to find alternative sources and sides of local communities that attractive to investors, where it is possible to invest in order to increase profits from these areas.

In the conditions of turbulent economic development due to the spread of the COVID-19 pandemic in most countries of the world and the introduction of restrictions on border crossing for both population and goods, the balanced development of Ukraine's regions is slowing down.

The level of financial independence of hromadas

There is a need to assess the impact of budget decentralization on the level of financial independence of hromadas by calculating the relevant indicators.

Analytical calculations will allow to determine the dynamics and trend of hromadas' development in relation to the financial independence of local budgets from the volume and types of transfers from the State Budget of Ukraine. In particular, there was calculated the coefficient of financial dependence, which is determined as the share of subventions from the State Budget of Ukraine in local budget revenues; budget decentralization ratio; expenditure decentralization ratio as a share of local budgets in the Consolidated Budget expenditures; modified expenditure decentralization ratio as a share of local budgets in the Consolidated Budget expenditures (excluding defense expenditures). The results of the calculations are given in Table 1.

Table 1. Dynamics of indicators of territorial communities' financial independence in the process of budget decentralization introduction in Ukraine for 2016-2019

Indicator	**2016**	**2017**	**2018**	**2019**
Coefficient of financial dependence, %	51.5	49.9	48.7	41.8
Coefficient of budget decentralization, %	14.5	16.4	15.8	8.1
Modified coefficient of decentralization of expenditures, %	44.6	49.9	48.8	44.7
Coefficient of expenditures decentralization, %	41.4	46.4	45.1	41.2

Source: calculated by the author according to the State Treasury Service of Ukraine www.treasury.gov.ua

These calculations show that, in 2016, local budgets were the most financially dependent on the state budget. In the conditions of the ongoing process of budget decentralization in Ukraine, there is a trend to increase the financial independence of local budgets. As can be seen, in 2018, local budgets were more financially independent of the state budget, but in 2019 the trend changed to the opposite (Koliada, 2018, p. 270).

As for the coefficient of budget decentralization, it is one of the most important indicators showing the ratio of local budget expenditures (excluding intergovernmental transfers) to GDP. The values of this indicator reflect the part of financial resources that is distributed among local governments. According to the normative indicators, if the indicator is below 10%, the level of decentralization is low; 15-10% - average; 15% - high. That is, in 2016 - the level of budget decentralization was average; in 2017-2018 - high; but in 2019 - low.

In addition, during the period 2017-2018, there was an increase in the modified coefficient of budget decentralization by expenditure. However, in 2019, the ratio returned to the level from 2016. The lowest coefficient of decentralization by expenditures was in 2019 (41.2%).

The subjects of the financial system, determining the needs of hromadas according to their interests, make it possible to come up ith a development strategy that ensures their self-development and independence, taking into account not only the interests of the state, but also the population. At the same time, in Ukraine, there is a significant differentiation in the volume and quality of public goods at the level of settlements, districts, cities, etc. In some district centers, there is much more useful and necessary infrastructure than in cities with small numbers. We can examine the public goods of a particular territorial community (hromada) according to the rating of state financial support for local and regional development.

Thus, in districts and villages, the living conditions of the population by age category from the youngest to the oldest inhabitants are improving. This is only because the ranking of priority needs is used and financial security indicators are monitored. Although there has been a misuse of budgetary resources for many years, because corruption schemes still work, we already have conscious shifts in the understanding of the country's population and what is necessary for their benefit. Corruption schemes are a threat to financial security, which affects not only the local community (hromada) itself, but also local businesses and the state

as a whole. That is why it is necessary to introduce and talk about financial literacy for different age groups in order to improve their well-being and living conditions in the country.

To better understand the financial interests of local communities (hromadas), we offer such characteristics as:

- observance of the collective agreement of definition of public needs, priorities and modernization of old needs for improvement of an economic condition of the territorial community (hromada);
- the factor of provision is financial security in the manifestation of the reproduction of goods in the form of social and economic indicators;
- due to the distribution of financial resources between the territories, there is a threat of high competition, which should be minimized by indicators of improving the lives of the population and increasing own income of the territorial community (hromada);
- minimization of the negative impact of threats in ensuring the financial interests of the community.

The mechanism of protection against threats in the process of realization of certain goals requires not only control over the implementation of certain tasks, but also the targeted use of financial resources with the involvement of a professional specialist in financial control and security. To this end, the Concept of reforming local self-government and territorial organization of power in Ukraine has been created, which aims to provide high-quality and public services, fruitful work of government and local governance in general. To achieve all the objectives of this concept, it is allowed to expand the boundaries of financial independence of local self-government in order to improve their own economic situation. Such innovations will protect and act not only in the interests of a particular territorial community (hromada), but also public finances in general.

We believe that it is necessary to set strategic goals for 5 years, and at the end of each year, to summarize and modernize the goals in accordance with changes in the economy. This will have a positive impact on the development of the territory and the state, as well as it will highlight significant improvements. Why such a term for setting goals? Because in 5 years, it is possible to gradually implement new ideas, methods and techniques, track their development and the trend of change for certain indicators. Reporting should be a prerequisite, as only with the help of control, the work is constantly moving. Any financial

and economic development of an entity has risks and threats to sustainable growth associated with it. To avoid or minimize this, it is necessary to calculate the degree of impact and the probability of losses that may occur, so that there are no uncontrolled fluctuations in sustainable development.

If the responsibility for the financial activity result of a local self-government body is transferred to the state power, then the principle of division of powers and competencies between levels of government will not be observed and certain goals of territorial communities' development will not be achieved. When local government representatives are aware of the seriousness of their actions, then there is a real potential to create something better than in other local communities (hromadas), and the method of competition continues to work. The main thing at this stage is not to forget about financial security, the result and quality of public services.

As for budget decentralization, it has clear goals for improving the work of local governments and transparent accounts of local and regional funding. We have indicators for which there are people who are trying to fulfill their direct responsibilities and improve the lives of the population and the state as a whole.

It needs to be noted that there is no separate body (unit) that would control only financial security, as a result, responsibility for financial resources and interests are assumed by local governments, which are forced to make changes in the legal framework or take responsibility. These changes create imbalances and destroy financial security, as there is a lack of transparency in the provision of information to consumers of public services and a low level of financial literacy of the population. And when, due to significant differentiation of financial potential of territorial communities, central executive bodies are obliged to objectively legislate to prevent the emergence of horizontal fiscal imbalances, when strengthening the financial security of some communities by reducing others or weakening the financial security of the country as a whole. The key in this process is that the mechanism of inter-territorial redistribution of financial resources works, which was not envisaged in the first stages of the creation of territorial communities.

The interdependence of local hromadas and state financial security

The interdependence of financial security of the public and the territory affects the financial security of countries. The last years of the future vertical construction of financial security are provided due to this and the horizontal construction of this system, because it requires a diet and a self-defined vertical construction. Currently, economic entities use only those scales and tools that are specified in the legislation. If necessary, allowing to "manage the situation, influence the situation" (which is etymologically contained in the change of the term "security") is absent in local communities when it comes to the principles of customs policy, the functioning of financial, monetary, credit risks. This conclusion follows from Article 92 of the Constitution of Ukraine, which provided for a single influence on certain areas of state law. Therefore, it is impossible to agree with those scientists who consider monetary, currency and banking, stock, customs and tariff and inflation security in the structure of financial security of the region (Medvid, 2007, p. 7; Karpinsky, 2008, p. 131).

There are objective limitations to the influence of individual financial security entities, namely territorial communities, on determining the priorities of national economic policy. At the same time, we believe that the formation of priorities of certain components of financial security, namely: budget, investment and debt security, depends on the actions and decisions of local communities (hromadas) and local governments.

Article 143 of the Constitution of Ukraine states that territorial communities, through local self-government, have the authority to manage communal property; approval of programs of socio-economic and cultural development and control over their implementation; formation, reorganization and liquidation of utility companies and organizations; etc., these are all the principles of functioning of the investment market, which is determined by law. In other words, territorial communities can participate in and influence the types of operations in investment processes, despite the fact that there are no principles for the functioning of the investment market, as provided by the legislation of Ukraine (Constitution of Ukraine).

Threats and risks to financial stability need to be anticipated for the future forecast of sustainable development. This minimizes their negative manifestation in the future or identifies ways to minimize the loss of their impact. Therefore, the main thing in the mechanism of financial security is to identify and structure events, phenomena and

processes that may be a threat to sustainable socio-economic development of the state and, accordingly, to meet the social needs of territorial communities. Threats need to be identified quickly so as not to trigger an intensification of the process.

The threat of loss of financial balance for the territorial community indicates, among other things, the insufficient level of legal support for the functioning of local self-government in the country. There are criteria by which you can identify the risks that arise in the legal field, namely:

1. Uncertainty of mechanisms for organizing the territorial communities' activities and clear economic rights. Therefore, it is difficult to fully realize their economic rights.
2. Inconsistency of the provisions of various legal acts. For example, local governments have such risks as: poor performance of powers, underfunding of territorial needs, incorrect redistribution of budget resources, hidden deficit of funds, credit indebtedness of local budgets.
3. Contradictory legal norms, namely the financial support of territorial communities (hromadas). A striking example is the administration of a single tax paid by local communities (hromadas), accrued to:
   - in 2014 - the special fund of local budgets;
   - in 2017 - the special fund of the State Budget of Ukraine;
   - other periods - the general fund of local budgets.

Territorial communities function as subjects of a single economic system, so they have a different type of threat to financial security. In particular, we can identify the following threats:

1. Dependence of current development financing volumes of territorial community on volumes of transfers in local budgets incomes;
2. Social instability among the population due to political events;
3. Depopulation of the territorial community population;
4. Weakening of the investment climate;
5. Significant probability of natural and man-made threats.

The source of threats to the territorial communities' financial security are external factors that regulate the economic policy of central authorities. The specialty of community functioning is to minimize the threats of internal factors. Such threats include:

1. Ineffective structure of the territorial economy.
2. Independent state of communal infrastructure, which exists in all regions of the country.
3. Insufficient resources for the development of territories and regions in general. In Ukraine, there are no public registers of communal property belonging to individual communities, for most settlements their territorial boundaries are not defined, the implementation of the mechanism of succession to communal property is not ensured. This situation, together with the lack of effective mechanisms for monitoring the activities of local authorities by local communities, leads to irrational use of communal property, inefficient economic activities of local councils, raids and mass illegal alienation of communal property (Teritorrial community, 2016, p. 42).
4. Low level of financial literacy, social activity, public consciousness.
5. Lack of a strategic plan for the activities of local self-regulatory bodies.

The need to confront threats to the financial security of local communities is beyond doubt. The success of the implemented measures depends on the completeness and timeliness of their implementation, as well as on the clear awareness of financial security entities of such threats. Note that the list of threats to the economic and financial security of the state is contained in the National Security Strategy of Ukraine (Strategy 2015). With regard to financial security, regulations have not been considered, although this would reduce the number of threats. To improve the work and efficient use of funds, the evaluation of the development strategy was calculated, namely through a SWOT analysis. This indicator makes it possible to calculate the strengths and weaknesses of economic entities and identify threats to financial security. If the above actions are followed, the territorial communities (hromadas) will function effectively and fully perform their functions and tasks, and financial resources will be used for their intended purpose without corruption schemes and other threats.

Conclusion

In summary, decentralization is a key reform and mechanism for creating affluent territorial communities (hromadas) and ensuring sustainable regional development in Ukraine.

Priority issues that need to be addressed in the decentralization process are - determining the list of tasks (scope of functions) to be solved by the central government and those entrusted to local governments, as well as legislative consolidation of revenue sources needed to form their own budget resources for their implementation.

Therefore, there needs to be emphasized the need for all responsible persons to 387ulfil their functional responsibilities in order to improve the lives not only of their own territorial community (hromada), but also of the population of the state as a whole. It is not for nothing that local communities (hromadas) have created local self-government bodies to make it easier to assess the needs of a certain territory and monitor their implementation. Due to the introduction of budget policy on decentralization, the division of responsibilities for control and monitoring of financial security not only at the local level, but also at the national level, is relevant.

Since financial security is characterized by threats of various phenomena, events and processes that interfere with the effective functioning of local governments, the development of territorial communities (hromadas), strategic plans and calculations of possible threats, using the method of assessment of SWOT-analysis, which shows the strengths and weaknesses of the strategic development of financial security and possible threats, need to be applied.

Thus, there is a need to study and research this topic to improve the functioning of the system of monitoring the financial security and economic condition of the state and the united territorial communities, even in difficult political conditions. Such measures will make it possible to make a rational choice of the real needs of the territorial community (hromada), set realistic priorities, as well as promote a certain level of financial security and sustainable economic development in general.

Further research in this area is necessary to determine the tax potential of a particular administrative-territorial unit and the optimal scope of state functions, which are appropriate and cost-effective to delegate to the appropriate local level on a permanent basis, thus

translating them into their own functions of local government and ensuring real independence and financial security of territorial communities.

Acknowledgement

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Financing the Activities of Environmental Institutions in Poland and Ukraine to Preserve Ecosystems: Historical, Political and Managerial Aspects

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Abstract: Preservation of the natural heritage for both Poland and Ukraine has been priority of sustainable development and public policies. Historically, both countries have a deep interest in the preservation of reserves, national nature parks and other categories of nature-protected fund and have had international cooperation for many years. However, the effectiveness of ecosystem conservation depends on the economic and financial instruments of public policy, which determined the relevance of this research topic. The basic principles of the state ecological policy of Ukraine for the period up to 2030, approved by the Law of Ukraine of February 28, 2019 № 2697-VIII, mention the possibility of development ecosystem services to ensure the sustainable development of society and the preservation of ecosystems. It is assumed that the biological diversity provided by ecosystem services should be preserved, assessed and restored accordingly. The State Forest Management Strategy of Ukraine until 2035 already provides for the monetization of ecosystem services in forestry, but only by reorganizing the system of calculation and use of environmental tax to allow the use of local and state environmental funds to pay for forest ecosystem services, measures maintaining the ecological sustainability of forests and preserving biodiversity in forests. For Ukraine, the positive experience of Poland in preserving ecosystems and monetizing the services and functions of ecosystems is important, which will be essential for the development of regulatory environmental policy of both countries. The main objectives of this work are to create a platform for cross-disciplinary dialogues that integrate different knowledge and research from diverse sectoral, geographical, historical, political, managerial and institutional perspectives and to develop an efficient system of preserving ecosystems, in particular to implement of international experience and to improve the socio-cultural development level of Ukraine.

Keywords: financing, economy, environmental institutions, income, GDP, macroeconomic factors, historical, political and managerial aspects, sustainable development.

JEL:O 130, B 220, D 720, D 920, N 010

Introduction

Poland of today is inhabited by near 40 million people and is a modern country situated in Central Europe, as well as a Member of the European Union since 2004. Poland successfully implements its ecologically sustainable development policy, in which natural resources are the pillars of sustainable development, both economic and social. The rational use of natural resources and their protection for the sake of both present and future generations form the foundations for the National Environmental Policy of Poland.

The successes in the area of sustainable development, improved quality of life and health of the population, effective protection of its resources and their rational use are the result of the system of financing environmental protection functioning in Poland, which has been flexibly adaptable to new challenges and based on both national and international sources of funding (The system of Financing Environmental Protection in Poland, 2020).

The specific nature of the Polish system of financing environmental protection involves a purposeful, strictly defined disbursement of funds originating from charges and fines for the use of the environment in the area of sustainable development. In Poland, the «polluter pays» principle has been implemented from the beginning of its political transformation and funds thus obtained are earmarked for projects that limit environmental pollution. Environmental funds, both the national and regional ones, also play a fundamental role in the distribution of foreign funds earmarked for environmental protection. The System of Funds constitutes a financial instrument and organizational tool for the Minister of the Environment that supports implementation of the National Environmental Policy of Poland. Ukraine has its own experience in financing environmental activities for the preservation of ecosystems, has formed its own concept of ecosystem management, but the experience of Poland is extremely interesting and relevant for it as a partner of the European Union.

The main objectives of this work are to create a platform for cross-disciplinary dialogues that integrate different knowledge and research from diverse sectoral, geographical, historical, political, managerial and institutional perspectives and to develop an efficient system of preserving ecosystems, in particular to implement of international experience and to improve the socio-cultural development level of Ukraine in the context of sustainable development.

Materials and Methods

The methods of evaluating the effectiveness of conservation have been used to better analyze the actual state of natural ecosystems and to investigate the dynamics of the cost of ecosystem preservation by various sources (state budgets of Poland and Ukraine, the costs of regional state administrations and local self-government). For improving management of ecosystem preservation, we have proposed to use the experience of Poland, concerning the taxation of land preservation, involvement of local authorities (communes) to address issues of ecosystem preservation management at the community and state authorized territory. The Poland's best practices of ecosystem preservation administration and recommendations for its implementation in Ukraine have been given.

The following general scientific methods have been applied in the research: systematization – to analyze the economic and legal principles of the of preserving ecosystems in Ukraine and European countries; cause and consequences – to study the causes and consequences of the financial crisis for the preserving ecosystems. The special methods used in the research are a method of expert poll – to collect estimates and judgments of competent persons on interests, roles and relationships in the interests of stakeholders in the field of preserving ecosystems; a method of analysis of hierarchies – to choose the optimal mechanisms of state regulation scenario of preserving ecosystems of the state; analytical tools, cost and benefits analysis – to assess the economic efficiency of the optimization budget financing of preserving ecosystems and implementation of Poland's best experience in Ukraine.

Literature review

In recent decades, scientists have been paying growing attention to the topics like the study of the problems and condition, prospects of preserving ecosystems, the rationalization of institutional activity, as well as the opportunities to use the cultural, historical and religious heritage development. The authors examined sustainable development comprehensively by the theoretical and applied dimensions of contemporary global perspective. In particular, R. Olaczek (2008), in the monograph "The Treasures of Nature and Landscape of Poland", proposes the modifications and models of existing management mechanisms based on adaptive (active), preventive (crisis), innovative, and quality management, which are

directed at ensuring competitiveness in each of the segments of the preserving ecosystems. Fung, I., Doney, S., Lindsay, K., and John, Ja (2005) have investigated the evolution of carbon sinks in a changing climate based on research from the National Academy of Sciences of the United States of America and showed the significant impact of greenhouse gas emissions on the state of ecosystems. Important aspects of financing the ecosystems of nature reserves have been raised in their work by well-known scientists, A. Babczuk and M. Kachniarz (2005), on the example of the financing system of national parks in Poland. Aspects of sustainable development in the context of nature conservation has been studied by E. Symonides (2008) and M. Rupert (2007). They have taken the reader through all aspects of sustainable development from the emergence of the paradigm to sustainability issues and all components of nature protection. But their studies should be defined as descriptive in nature with elements of constructive financial analysis of preserving ecosystems.

National Funding in Poland

In Poland, one of the national institutions financing energy efficiency has been the Environmental Protection and Water Management Fund (EPWMF), which is the main source of financing ecoinvestments in this country. Its offer includes both domestic and foreign funds (including funds of EU). Funds dedicated to activities related to improving energy efficiency are part of programmes aimed at protecting the atmosphere, including improving air quality and cross-domain. It derives revenues mainly from fees and penalties for using the environment, exploitation and concession fees, energy sector fees, resulting fees from the Act on the recycling of end-of-life vehicles and from sale of assigned greenhouse gas emission units. This National Fund conducts independent financial management, acting on the basis of the Environmental Protection Act and in accordance with the EU principle that «the polluter pays». The National Fund has a rich financial offer tailored to the expectations of a wide range of beneficiaries: local governments, enterprises, public entities, social organizations and individuals (National Funding in Poland, 2021).

People and economy exist and function in nature and thanks to nature. In environment management this concept comprises both the management subject and the entities influenced by management instruments. Environmental management instruments comprise several dozen positions. This is a diversified spectrum of detailed management instruments.

There are several classifications of these instruments. The most frequently used one comprises the division into the following instruments: economic, administrative, legal, voluntary and instruments of social influence. Management subject is the widely perceived natural environment, i.e., the following levels of life: ecosystem, bio-geographical, species and genetic, as well as environment elements – space and land surface, waste, atmospheric air, noise and vibrations, water as well as pollutions, radiation and ionizing radiation. The main management instruments could be: economic entities and various organizational units, individuals, groups and communities (Environment Management in Poland, 2012).

The rapid degradation of the natural environment of the Earth has been one of the most serious problems of today. In the beginning of the XXI century, the global community faces numerous threats and problems, local, regional and worldwide challenges. The following can be may pointed out: the 2019 Covid-19 pandemic, crisis of debts, the threat of global finances' collapse, uncontrolled demographic development, poverty and social inequality as well as drug abuse and present-day civilization diseases. In the short term, all these problems will not fade away, being mostly of a structural character and will require ceaseless handling. Ecological threats may be appeased only due to mutual and coordinated activities undertaken by organizations and institutions, governments, social groups, enterprises and households on different levels, beginning with the global one on to the microeconomic level for the protection of the environment and the promotion of balanced development principles.

Risk assessment in environmental activities

Financial resources always belong to limited resources, so their effective use is of paramount importance. Environmental and social risks can be mitigated through compliance with environmental and social regulations and international environmental and social standards. Risk assessment in environmental activities has been one of the most important areas in the optimization of environmental costs. A financial institution's environmental and social risks are those of their clients (investees) and are inherent in the nature of a client's (investee's) operations. These risks are not static, but rather are dynamic over time and subject to change.

A financial institution can achieve best results in the case of developing and implementing an Environmental and Social Management System (ESMS) to systematically

assess the environmental and social risks and opportunities arising from their clients' (investees') operations and manage its exposure to risk. Some potential social and environmental risks may not seem significant or relevant at the time of approval of a financial transaction, but may become so during execution of nature-protection measures. Social and environmental risks, such as spills or explosions, may seem unlikely to occur, but when they do, the environmental and social impact can potentially be extremely high. All this requires proactive assessment, identification and management of environmental risks before they become significant or result in an adverse outcome on the investee (Environmental and Social Risk for Financial Institutions, 2021).

2020, before the coronavirus pandemic

Before the coronavirus pandemic outbreak hit the global economy, Poland was among the fastest-growing economies in the whole European Union. Household consumption, fueled by increases in budgetary expenditures, a tight labor market, and rising wages, continued to grow. This, together with continuing low interest rates and the execution of European funds-related investments, helped Poland's economic growth prospects. However, with the pandemic, the situation has deteriorated significantly: the cost of nature protection is significantly reduced, especially from the state budget. Small and medium-sized businesses have difficulty with environmental investments as well.

In the short-term, however, the main challenge is to mitigate the social and economic impact of the COVID-19 pandemic. Although the full impact of the virus remains uncertain, a prolonged outbreak would significantly curb economic activity, strain the health care system, affect supply chains, and depress investor sentiment and consumer demand, ultimately impacting the supply side and leading to a deeper recession. Under such a downside scenario, the economic and fiscal impact in 2020 was more severe, with implications for jobs and poverty (Protection in Poland, 2020).

Such activities are achievable provided adequate financing is ensured – and this is not easy with a deficiency of financial resources. On the positive side, Poland has the fiscal and monetary space to mitigate the adverse effects of lower global and domestic demand and shield its financially vulnerable populations, potentially leading to a quicker rebound in 2021 and 2022 (The World Bank, 2021).

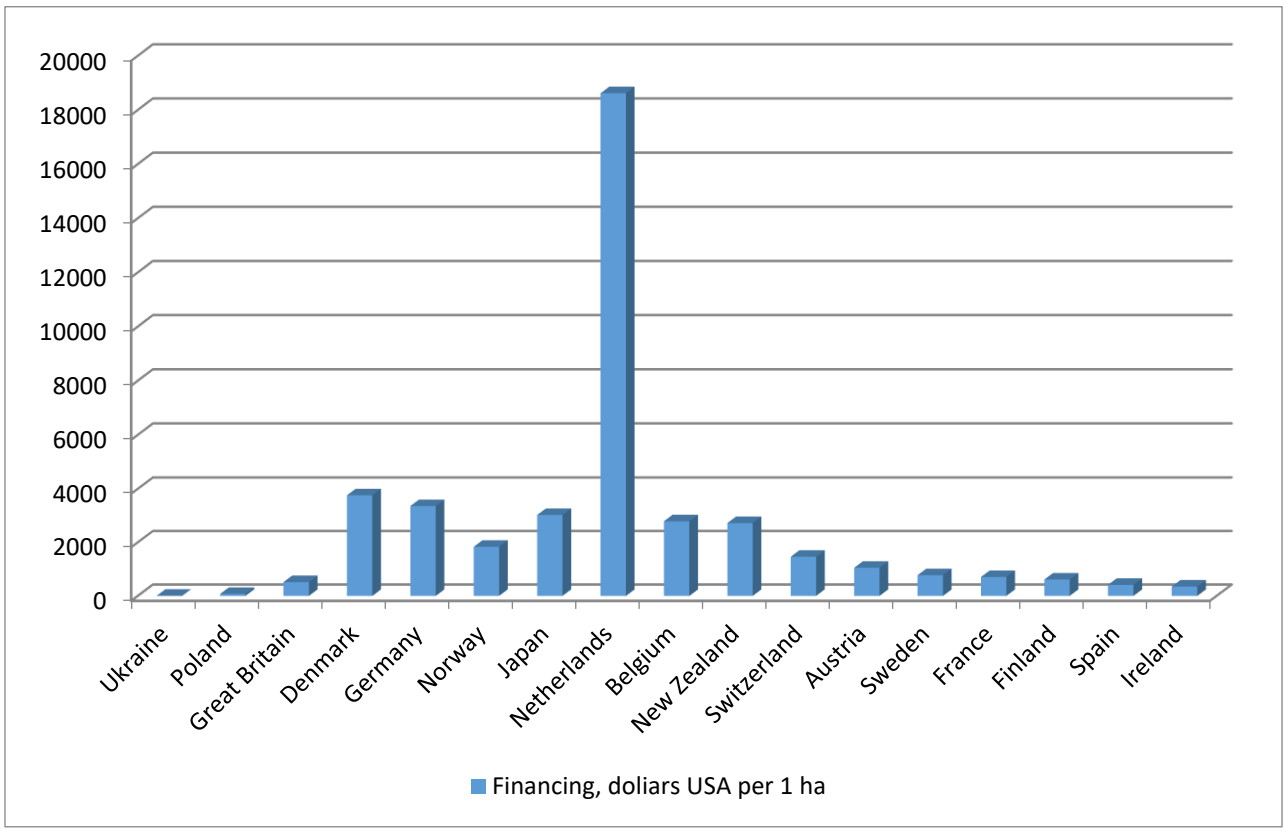
Table 1. Analysis of the ecosystems conservation financing of developed countries

Country	Area of the country, km2	State protection indicator, %	Financing, million dollars total	Number of plant species in all categories of the red list of endangered species	Number of species of animals in all categories of the red list of endangered species	Area of nature reserves and objects, ha	Financing per 1 hectare, dollars per year
Netherlands	41,526	19	14,690	275	211	788,994	18,619
Denmark	43,094	18	2,980	99	55	792,929.6	3,758
Germany	357,168	23	27,560	211	115	8,214,864	3,355
Japan	377,944	13	14,410	86	112	4,765,874	3,024
Belgium	30,528	23	1,958	211	192	702,144	2,789
New Zealand	268,021	11	8,000	114	189	2,940,190	2,721
Norway	385,178	13	9,120	143	163	4,964,944	1,837
Switzerland	41,285	26	1,590	133	127	1,085,796	1,464
Austria	83,855	25	2,200	242	211	2,090,505	1,052
Sweden	449,964	11	3,830	99	128	4,949,604	774
France	640,679	10	4,470	235	160	6,310,688	708
Finland	338,424	12	2,490	186	142	4,061,088	613
Great Britain	243,610	19	2,390	229	156	4,618,846	518
Spain	504,645	7	1,450	144	167	3,502,236	414
Ireland	70,273	9	220	180	102	625,429.7	352
Poland	312,679	8	120	205	128	2,345,093	75
Ukraine	603,628	6	12	541	382	3,259,591	7

Source: summarized by the authors on the basis of (The World Bank in Poland, 2021).

In this paper, based on data from the World Bank, a study of the costs of preserving ecosystems in developed countries is conducted. According to the results, Netherlands spends the most on one hectare of ecosystems – more than 18 thousand dollars, second place went to Denmark – more than 3.7 thousand dollars, in third place is Germany – more than 3.3 thousand dollars. Ukraine ranks last in the overall ranking of countries and has only about USD 8 funding per hectare. In the Republic of Poland, annual funding for ecosystem conservation is just over USD 75 per year (fig. 1).

Fig. 1. Per hectare costs for biodiversity conservation financing in developed countries



Source: summarized by the authors on the basis of: (The World Bank in Poland, 2021).

This situation requires the search for new tools for financing the conservation of ecosystems in Ukraine and the Republic of Poland, taking into account the positive experience of developed countries.

Situation in Ukraine with ecosystem financing

The State Strategy for Regional Development of Ukraine for the period up to 2020, approved by the Resolution of the Cabinet of Ministers of Ukraine of August 6, 2014 № 385, provides for an increase in the National Protected Fund relative to the total area of the country until 2021 to 15% in Ukraine and Donetsk region to 8,9%. However, the balance of natural areas in the Steppe zone of Ukraine does not exceed 10%, despite the fact that these areas are no longer intact, but are in a state of varying degrees of degradation. These areas have been used primarily as pastures and are located in water protection zones on the slopes of river valleys and gullies. Since 2012, state-owned agricultural lands have been managed by the Main Departments of the State Geocadastre in the oblasts. During this time, the share of

virgin lands has decreased significantly, as the State Geocadastre officially distributes these lands for commercial agricultural production or for personal farming, while, as a rule, bypassing the law changes the purpose of pastures for plowing, although the vast majority of these lands is located on slopes with an incline of more than 7 degrees, so in accordance with Article 47 of the Law of Ukraine «On Land Protection», plowing of such slopes is prohibited. According to part 2 of Art. 111 of the Land Code of Ukraine, the State Geocadastre could impose restrictions on the use of such sites, but this is not practiced.

Per one hectare of the nature reserve fund of Ukraine, the conservation of biodiversity will cost USD 732 per year, which is much less than in developed countries. Therefore, it is profitable for foreign countries to invest in the conservation of biodiversity in Ukraine, as it is much cheaper than preserving nature at home. Such foreign investment will quickly pay for itself with global effects from the functioning of Ukraine's forest and wetland ecosystems. The transfer of land ownership to local communities is unlikely to remedy this situation at the moment, so regardless of who disposes of virgin land, a nationwide moratorium on plowing and transfer to private ownership should be introduced. As a solution to this problem, it is possible to refer all virgin lands to the category of especially valuable such as forest lands, because in the steppe and forest-steppe zones steppes and meadows are natural landscapes and play a key role in biodiversity conservation, climate change mitigation, recreation, etc.

There are many places of unique ecosystem confluence in Ukraine; here are a few of them. Ukrainian Carpathians, in the latest years, became an incredibly popular recreation spot not only for locals but also international tourists, who come to Ukraine seekin untouched nature and desolate hiking spots to reconnect with nature. The unique nature of Gorgany, a mountain range of the Outer Eastern Carpathians in Western Ukraine, was recognized by the government officials way back in the 1940s. Unfortunately, WWII prevented organizing the dutiful protection of the area. Roztochya Biosphere Reserve is one of the hidden natural reserves in Ukraine, located 20 kilometers from Lviv, but the spot is usually skipped in favor of the more touristic locations like the Zhovkva Castle. Medobory Natural Reserve often pops up when tourists seek places to visit the Podilski Tovtry Natural Park in Chemerivstsi. The reason behind it is that Medobory was created for the same reason – preservation and popularization of the unique natural beauty. Tovtry is a local name for a chain of lime hills that extends for 200 km from Lviv Oblast to Moldova. However, today, in order to preserve these

ecosystems and beautiful nature, it is necessary to develop financial instruments that work well in developed countries.

Due to environmental degradation, ecological systems in today's world are threatened. There have been introduced payment for ecosystem services (PES), broadly characterized as any payment that is aimed to incentivize conserving and restoring ecological systems. These systems could include any ecosystem, such as a river or forest, that facilitates vital environmental processes (Payments for Ecosystem Services Getting Started: A Primer, 2015). Forests, for instance, serve multiple functions in this regard, provide environmental goods, such as food, facilitate nutrient cycling and many other biological processes (Yakymchuk A. et al., 2020).

Conclusions

Netherlands spends the most on one hectare of ecosystems – more than USD 18 thousand dollars, second place goes to Denmark – more than 3.7 thousand dollars, in third place is Germany – more than USD 3.3 thousand. Ukraine ranks last in the overall ranking of countries and has only about USD 7 funding per hectare. In the Republic of Poland, annual funding for ecosystem conservation is just over USD 75 per year. Per one hectare of the nature reserve fund of Ukraine, the conservation of biodiversity will cost USD 731.9 per year, which is much less than in developed countries. Therefore, it is profitable for foreign countries to invest in the conservation of biodiversity in Ukraine, as it is much cheaper than preserving nature at home. Such foreign investment will quickly pay for itself with global effects from the functioning of Ukraine's forest and wetland ecosystems.

As a solution to this problem, it is possible to refer all virgin lands to the category of especially valuable - areas such as forest lands, because in the steppe and forest-steppe zones, steppes and meadows are natural landscapes and play a key role in biodiversity conservation, climate change mitigation, recreation, etc.

Nowadays, conservation finance is an important task for the governments of Poland and Ukraine, and over the years, many mechanisms have been developed and tested. To that end, rigorous approaches have been developed to determine, validate and monitor the conservation impact of such efforts, such as the Theory of Change Approach promoted by WWF. Yet, for majority of the last 25 years, the discussion has been geared toward the

conservation objective and focused on how to meet the financing demand for conservation programs and strategies, i.e., finding investments to activate particular conservation mechanisms and scaling them up to broader programs and eventually whole markets. Using financial incentives, payments for ecosystem services are a form of conservation finance that rewards people for maintaining these ecosystem services. In order to facilitate these transactions, the service provider must clearly define the service and secure an ecosystem which needs those particular resources. In addition, service purchasers carefully monitor the providers to ensure that conversation has been efficiently carried out.

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Underachievement in education, children at risk of poverty and social expenditures of local budgets: Empirical analysis of the EU countries

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Abstract: The implementation of important sustainable development goals is closely linked to budget-financed provision of public goods. Numerous scientific studies prove the importance of quality education for the development of up-to-date competences and encouragement of a frugal attitude towards natural environment. This is the reason why the level of underachievement in reading, maths or science is included in the system of indicators used to assess the progress made in the attainment of sustainable development goals. The acquisition of education is a multi-faceted complex process, which is affected by a range of social factors. The unassailable fact is that low level of household well-being produces a negative impact on the capabilities of children to acquire proper education.

The goal of this study is to reveal the nature of the relationship between the level of underachievement in reading, maths or science and the percentage of children at risk of poverty or social exclusion, on the one hand, and social expenditures of budgets, on the other. Thus, by applying panel data analysis on a set of empirical data for 28 countries of the European Union over the period from 2007 to 2018, we studied the impact of budget expenditures, including expenditures of local budgets on pre-primary and primary education, secondary education and social protection of families with children, on the outcome variables. The findings revealed that larger expenditures on secondary education allocated from both local budgets (the coefficient of dependence equal to (–4.87)) and state and regional budgets (the coefficients of dependence equal to (–3.34)) produce an inverse impact on the level of underachievement in reading, maths or science. Besides, we find that the level of underachievement in reading, maths or science decreases as a result of increases in local budget expenditures on pre-primary and primary education (the coefficient of dependence equal to (–2.11)) and increases in local budget expenditures on social protection of families and children (–1.9). The study also finds support for the inverse impact of local budget expenditures on social protection of families and children (the coefficient of dependence equal to (–4.38)) and pre-primary and primary education (the coefficient of dependence equal to (–2.16)) on the percentage of children at risk of poverty or social exclusion. The findings of this research can be used for planning and implementing measures aimed at the realization of SDG objectives, as well as for modelling effective budget policies.

Key words: local budgets, budget expenditures, budget expenditures on education, budget expenditures on social protection, underachievement in education, risk of poverty, risk of social exclusion.

JEL: H72; H75; C13; I21; D30.

Introduction

In searching for ways to produce goods and improve people's well-being, human activities often give rise to many risks. Recent research testifies to aggravation of such problems in the environmental sphere, in particular. The Global Risks Perception Survey 2020 identifies the following major groups of risk by likelihood of occurrence: 1) extreme weather; 2) climate action failure; 3) human environmental damage; 4) infectious diseases; 5) biodiversity loss; 6) digital power concentration; and 7) digital inequality [World Economic Forum 2021]. Comprehension of the nature of global problems and understanding of the logical connections between existing risks and consequences of human activity encourage the mankind to undertake coordinated measures in order to remedy the situation. As a result, the paradigm of sustainable development emerged as a blueprint for achieving a better and more sustainable future for all of us.

In September 2015, the UN General Assembly approved a new Agenda for Sustainable Development. This document outlines 17 Sustainable Development Goals and 169 targets which are to be achieved [Resolution 2015]. In particular, the document assigns an important role to assurance of quality education at all levels and of social well-being. These specific spheres fall within competencies of local self-governments. Thus, now local budgets are not only being considered as a means for community development, but also serve as a key lever in achieving major goals of assuring sustainable development.

Theoretical premises

Aggravation of the global threats, which create powerful challenges for mankind, could not have escaped the interest of leading researchers. The issue of the significance of education for the achievement of Sustainable Development Goals (SDGs) by different societies has been actively discussed in scientific literature. R. J. Didham and P. Ofei-Manu suggest that integrating main SDG concepts into the study process could help citizens better comprehend global problems [Didham & Ofei-Manu, 2015]. In the same context, C. Buckler and H. Creech conclude that education enhances the sense of responsibility among individuals as global citizens and helps them to prepare better for the world that they will inherit [Buckler & H. Creech, 2014]. A recent study titled "Decade of Education for Sustainable Development (2005-2014)" performed by UNESCO, the world's leading international organization in the

sphere of education, shows that governments of many countries incorporate Sustainable Development Goals into the education process in order to prepare their citizens to address the problems of sustainability in the years to come. The findings of the empirical investigation carried out in 18 countries also corroborate the existence of a positive relationship between the inclusion of SDG concepts into the study process and the quality of education [Laurie, Nonoyama-Tarumi, McKeown & Hopkins, 2016]. In view of the positive impact of education on mitigation of adverse climatic changes and improvement of overall human behaviour, it has become one of the main SDG objectives to ensure inclusive and fair high-quality education, as well as to create opportunities for life-long learning for all [Rieckmann, Mindt & Gardiner, 2017]. E. Striessnig, W. Lutz and A. G. Patt place special emphasis on the positive effects of investments into primary and secondary education for overcoming the existing global insecurities [Striessnig, Lutz & Patt, 2013]. The understanding of the significance of primary and secondary education for SDGs resulted in that many primary and secondary schools around the world have been implementing a broad and diverse set of initiatives on sustainable development education since 2005, whereas the scope, volume and depth of sustainable development issues covered in school curricula have significantly grown [Buckler & Creech, 2013; Benavot, 2014]. P. Ofei-Manu and R. J. Didham substantiate that in order to solve the systemic objectives of sustainable development, more attention will have to be paid to accessibility of education and quality of education services in the future [Ofei-Manu & Didham, 2014]. The performed research corroborates the positive role of education in realizing the tasks of sustainable development and casts light onto the mechanism of such impact, which consists in the ability of high-quality education to change human activity so that people pay more respect to natural environment.

Usually, the nature of any social phenomenon can hardly be explained by the influence of only one factor. Thus, it is no surprise that such a complex social property of people as education depends on a broad spectrum of various factors. However, the fact that there is a complicated system of linkages between the level of an individual's education and other factors does not mean that the results of schooling do not depend on the quality of education services and their accessibility for every child. These are the main objectives of public education provided at the expense of budget funds.

Thus, scientists often link the overall level of education in a society to operational efficiency of its public education system. This is particularly important in the context

of realizing SDG objectives because a significant share of acquired competences in the modern education systems is necessary for production of global public goods, not only for generation of private benefits. B. Tessa, P. John and G. Stoker point to the existence of positive consequences of government initiatives aimed at achieving progress in education. However, they also admit that the cause and effect relationships are often rather complex [Tessa, John & Stoker, 2006]. The empirical study of children's school achievement carried out by S., Habibullah and J., Ashraf determined that higher academic achievement depends on better school conditions [Habibullah & Ashraf, 2013]. An empirical study performed by E. Striessnig, W. Lutz and A. G. Patt based on data for 125 countries supports the thesis that investments into general primary and secondary education are the world's most effective strategy of preparation for resolving uncertain threats of future climate changes [Striessnig, Lutz & Patt, 2013] and the quality of education has an impact on the environment [Koziuk, et al., 2019]. R. J. Didham and P. Ofei-Manu corroborate the positive impact of high-quality education on realization of SDGs, paying attention to positive effects of integration between the measures aimed at education development for purposes of realising SDG [Didham & Ofei-Manu, 2015] and other sustainable development objectives [Glonti et al., 2020]. When comparing the effectiveness of adaptation investments into education and physical infrastructure for increasing the adaptive capacity of countries to climate change, W. Lutz, R. Muttarak and E. Striessnig assert that adaptation investments into education can be more effective, especially in situations when the consequences of climate change remain highly uncertain [Lutz, Muttarak & Striessnig, 2014]. Their findings point to the dependency between the quality of education and school conditions. Scientific research also proves the direct positive impact of investment in education upon the success of SDG objectives. Thus, it is possible to trace a link between the volume of resources invested into the education sphere and quality of education and the achievements in realising SDG objectives. Among the potential sources of education financing, scientists place emphasis on the importance of budget resources of local governments. I. de C. Filho and S. Litschig proved that an increase in transfers to local governments in Brazil produced a long-term increase in the level of literacy and education among children of school age [Filho & Litschig, 2020].

Student achievement in education is often associated with the social stance of the families raising them. R. Cassen and G. Kingdon conclude in their study that student underachievement is caused by a set of factors related primarily to social characteristics

of the students and their families. The researchers found that achievement in school was negatively affected by being male students, having special education needs, and/or having low well-being and receiving social support by their families [Cassen & Kingdon, 2007]. F. Demie further elaborates on the impact of social factors on student achievement. Based on the example of migrant schooling in England, the researcher found support for the impact of economic well-being on students' academic achievement [Demie, 2019]. B. P. Ackerman, E. D. Brown and C. E. Izard point to the existence of a link between the level of academic achievement and the level of students' poverty placing emphasis on the complex nature of such relationship [Ackerman, Brown & Izard, 2004]. A. Nyangarika and Z. J. Ngasa develop convincing arguments with respect to the relationship between the level of underachievement in school and the children's stay in orphanages, as well as the influence of a range of social and demographic factors [Nyangarika & Ngasa, 2020]. Therefore, social support of families with children is instrumental for attaining better results in education. It is also important to emphasize that social support of families with children not only contributes to attainment of better results in education, but also realizes another main function – protection of households with children from poverty.

The provision of quality education and minimization of child poverty risks represent an urgent task for governments in the context of attaining SDGs. Financial aspects play a significant role in the realization of these tasks. L. Boeskens, G. Lima, D. Nusche, T. Radinger and C. Shewbridge arrived at a conclusion that a well thought-out policy of school financing is critical for achieving the objectives of assuring equitable and effective quality education in schools [Boeskens et al., 2017]. The scientists explain that this dependence exists because the financing of education plays a key role in the allocation of resources. For many years now, the conclusions drawn by G. Psacharopoulos remain convincing with respect to the fact that among all education levels, primary education generates the largest benefits and plays a major role in forming the overall education level [Psacharopoulos, 1973]. In developed countries, the key role in education financing is played by local budgets. Under the influence of decentralization processes, the bodies of local self-government usually act as intermediaries that distribute central budget financing among schools, as well as use their own revenues to increase the amount of financing available [Boeskens, Lima, Nusche, Radinger & Shewbridge, 2017]. By providing public goods at the expense of local budgets, local governments assure the attainment of sustainable development goals.

Thus, scientific literature corroborates the positive impact of education on the attainment of sustainable development goals. Moreover, it has been found that the level of education among individuals depends, in particular, on the well-being of households. The process of decentralization in public finance resulted in the assignment of authority for provision of education and social support of family and children to local governments. Therefore, scientific research substantiates the logical implications of social budget expenditures for realization of sustainable development goals. However, we have not found any studies that would cast light onto the dependence between the underachievement in education, children at risk of poverty and social exclusion and the social expenditures of local budgets.

Methodology

The level of underachievement in education depends on the availability of equal access to high-quality education in the country, in particular pre-primary, primary and secondary education, which is ensured by allocation of certain amounts of budget financing. Budget-financed measures of social support provided to children and families lead to reduction in the level of underachievement in education. Larger opportunities with respect to providing equal access to pre-primary, primary and secondary education, as well as family and child support, are important for realizing yet another objective of sustainable development – reduction of child poverty. In what concerns the realization of sustainable development goals, local budget expenditures play the largest role within the system of budget spending on pre-primary, primary and secondary education, and support for children and families.

The subjects of the study include 28 countries, with data on different factors for each of the countries shown in Table 1. In cases when no data is available, the mean arithmetic value of the previous value and the subsequent value of the property in the sample is used. The time period under study covers the years from 2008 to 2018.

Table 1. Description of input data

Variable	Economic meaning	Unit
ChRPSEx	Children at risk of poverty or social exclusion	Percentage of gross domestic product
UrSt	Underachievement in reading, maths or science	Percentage of total population in the same age group
LBPPEd	Local budgets expenditure on pre-primary and primary education	Percentage of gross domestic product
OBPPEd	Other budgets expenditure on pre-primary and primary education	Percentage of gross domestic product
LBSEd	Local budgets expenditure on secondary education	Percentage of gross domestic product
OBSEd	Other budgets expenditure on secondary education	Percentage of gross domestic product
LBFC	Local budgets expenditure on social protection of family and children	Percentage of gross domestic product
OBFC	Other budgets expenditure on social protection of family and children	Percentage of gross domestic product

Source: own work

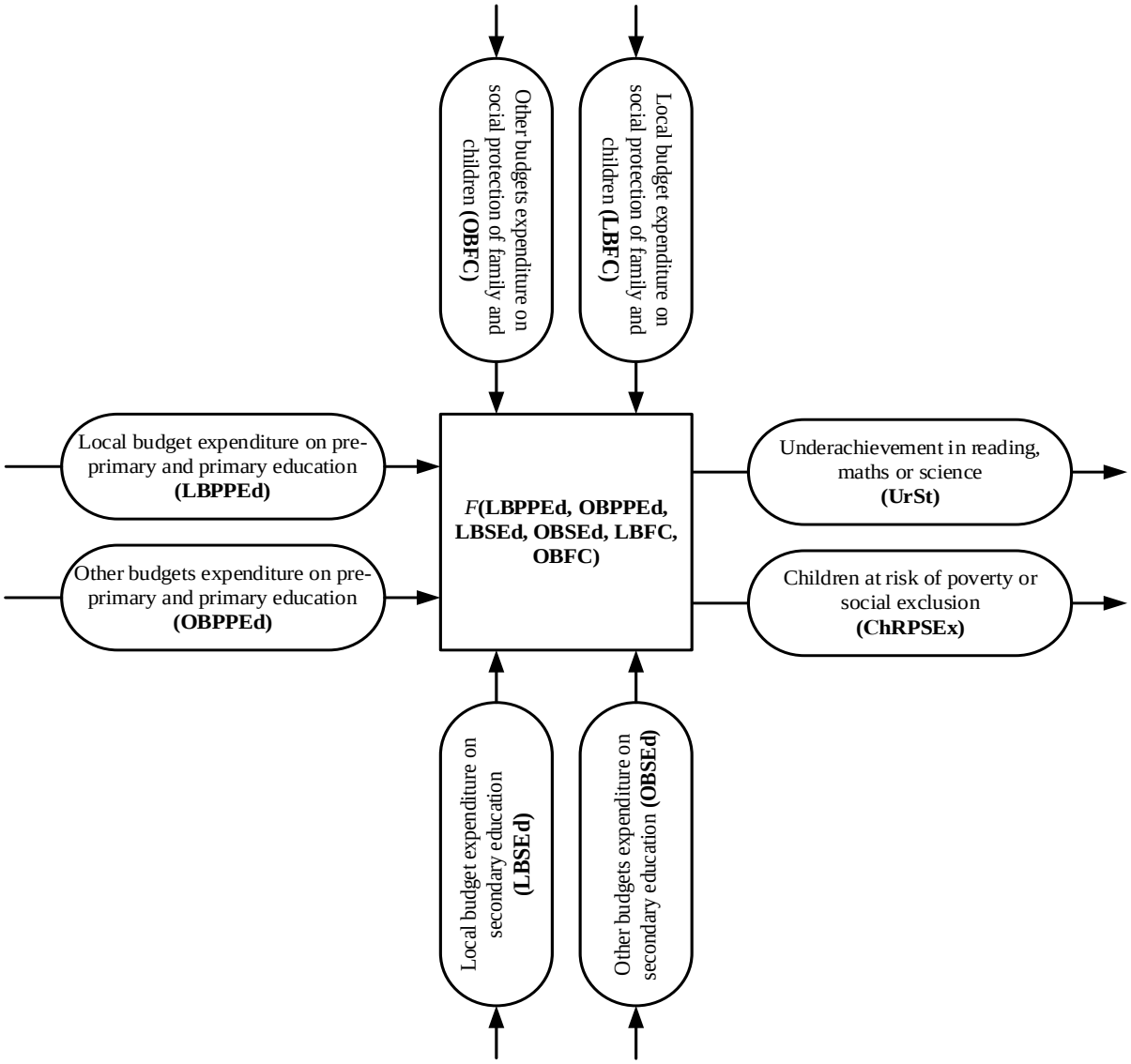
In order to reach the goal of the article, we used the data of the European Statistical Office on SDG attainment and the data on budget expenditures. As outcome indicators, we used the data on the level of underachievement in reading, maths or science and the data on the percentage of children at risk of poverty or social exclusion. The data on underachievement in reading, maths or science measures the share of 15-year-old students failing to reach level 2 ('basic skills level') on the PISA scale for the three core school subjects of reading, mathematics and science. The data stems from the Programme for International Student Assessment (PISA), which is a triennial international survey aiming to evaluate education systems by testing the skills and knowledge of 15-year-old students [Underachievement]. The percentage of children at risk of poverty or social exclusion is defined as the sum of children (0-17) who are at-risk-of-poverty or severely materially deprived or living in (quasi-)jobless households (i.e. households with very low work intensity (below 20%)) as a share of the total population in the same age group [Children].

As factor indicators for purposes of this study we have chosen the shares of expenditures on primary and secondary education in GDP, in particular the expenditure on pre-primary level of education (ISCED 0 – Initial stage of organised instruction, designed primarily to introduce very young children to a school-type environment) and primary level of

education (ISCED 1 – Programmes normally designed to give students a sound basic education in reading, writing and mathematics) [Manual 2019]. Budget expenditures on secondary education comprise expenditures on the lower secondary level of education (ISCED 2 – The lower secondary level of education generally continues the basic programmes of the primary level, although teaching is typically more subject-focused, often employing more specialised teachers who conduct classes in their field of specialisation) and the upper secondary level of education (ISCED 3 – The final stage of secondary education in most countries. Instruction is often more organised along subject-matter lines than at ISCED level 2 and teachers typically need to have a higher level, or more subject-specific, qualification that at ISCED 2. There are substantial differences in the typical duration of ISCED 3 programmes both across and between countries, typically ranging from 2 to 5 years of schooling) [Manual 2019]. Budget expenditures on "Family and children" include the following: the provision of social protection in the form of cash benefits and benefits in kind to households with dependent children; administration, operation or support of such social protection schemes; cash benefits, such as maternity allowances, birth grants, parental leave benefits, family or child allowances, other periodic or lump-sum payments to support households and help them meet the costs of specific needs (for example, those of the lone parent families or families with handicapped children); benefits in kind, such as shelter and board provided to pre-school children during the day or part of the day, financial assistance towards payment of a nurse to look after children during the day, shelter and board provided to children and families on a permanent basis (orphanages, foster families, etc.), goods and services provided at home to children or to those who care for them, miscellaneous services and goods provided to families, young people or children (holiday and leisure centres) [Manual 2019].

The goal of this study is to determine the influence of all factors, as well as to analyse the contribution of each factor separately. This analysis will enable us to determine the significance of different factors for explaining the differences in the levels of underachievement in reading, maths or science and children at risk of poverty or social exclusion in different countries.

Figure 1. *The scheme of modelling the influence of social and economic factors of budget expenditures at different levels on the level of poverty risk*



Source: own work

The question of studying the influence of social and economic factors on the risk of poverty and underachievement in different countries is rather complex. Such important problems cannot be solved simply by describing the observed regularities. Econometric studies, which perform analysis of cross-sectional and time series data separately, can only describe the average behaviour of subjects. Such models often turn out insufficient for the study of economic phenomena. This problem can be avoided and factor heterogeneity can be studied by using panel data, which represents extended cross-sectional datasets, where each

separate subject is observed over a certain period of time. Panel datasets include both cross-sectional and longitudinal data, thus combining the advantages of both types of data.

Results

The descriptive statistics for variables in Table 2 shows that the distribution of variables is somewhat different from normal; some asymmetry is present – the values of the median and the mean are different, while asymmetry coefficients have non-zero values.

Table 2. Descriptive properties of variables used in this study

Indicators	Response variables		Factor variables					
	UrSt	ChRPSEx	LBPPEd	OBPPEd	LBSEd	OBSEd	LBFC	OBFC
Mean	23.84	26.29	1.13	0.57	0.84	0.92	0.51	1.37
Median	21.95	24.7	0.86	0.1	0.9	0.9	0.19	1.3
Minimum	6	11.9	0	0	0	0	0	0.2
Maximum	53.4	52.5	4.29	2.1	2.7	2.4	4.62	3.6
Std. Deviation	9.68	9.15	0.97	0.65	0.68	0.76	0.85	0.71
Coefficient of variation	0.41	0.35	0.86	1.15	0.81	0.82	1.66	0.51
Asymmetry	1.08	0.78	0.93	0.73	0.35	0.23	2.9	0.71
Excess kurtosis	1.01	0.32	0.36	–0.99	–0.92	–1.46	8.65	0.26

Source: based on data by Eurostat: https://ec.europa.eu/eurostat/data/database

The analysis of the properties in Table 2 shows that the indicators of local budget expenditures on secondary education (LBSEd), local budget expenditures on primary education (LBPPEd), expenditures of other budgets, which include the state budget and regional budgets, on social protection of family and children (OBFC), and expenditures of other budgets (state and regional budgets) on secondary education (OBSEd) have the largest mean values.

Panel data represents a two-dimensional dataset, in which one dimension is cross-sectional, featuring, in our case, countries ($1 < i < 28$), whereas the other one is longitudinal, covering a time period of eleven years ($2008 < t < 2018$). Thus, panel data has a double subscript (i, t).

A general fixed effects panel data model is expressed as an equation:

$$Y_{it} = \alpha_i + \beta X_{it} + u_{it},$$

where α_i denotes the individual-specific effect observed for subject *i*, β is the coefficient of the vector of common factor variables X_{it} observed for cross-sectional subject *i* over period *t*, errors u_{it} are independent and identically distributed random values (across countries and across time).

Fixed effects models allow to eliminate the impact of unobserved variables and to obtain unbiased estimates of the parameters, thence effects α_i represent fixed unobservable parameters of the model.

In our case, it would be feasible to use the fixed effects panel data model, since the entities under study are countries featuring individual attributes but assigned to the "same type", which means they cannot be considered random.

Analysis of the dependence between the level of student underachievement in reading, maths or science and the social expenditures of local budgets

The above-described approach was used to investigate the impact of selected variables on the level of underachievement in reading, maths or science. The study is based on the data for 28 cross-sectional subjects (countries) over 6 time periods (years 2003, 2006, 2009, 2012, 2015, and 2018). Model 1 (Table 3) indicates that the impact on response variable produced by expenditures from different types of budgets is inverse in nature, which means that the level of underachievement decreases when these budget expenditures increase.

Table 3. Model 1 "The relationship between the level of underachievement in reading, maths or science (UrSt) and factor variables" (weighted least squares method), R^2 =0.652

Variables	Coefficient	Std. deviation	*t*-Statistics	*p*-Value
Const	33.02	1.99	16.54	1.54e–08 ***
LBPPEd	–2.11	0.62	–3.38	0.009***
OBPPEd	0.57	1.22	0.46	0.63
LBSEd	–4.87	0.78	–6.26	3.28e–09 ***
OBSEd	–3.34	0.79	–4.23	3.92e–05 ***
LBFC	−1.6	0.41	–3.68	0.002 ***
OBFC	–0.09	0.53	–0.18	0.85

*Note: *** - the level of confidence for model parameters is at 99% level.*

Source: based on data by Eurostat: https://ec.europa.eu/eurostat/data/database

Based on the developed model (Table 3), we can now construct an equation describing the relationship between the level of underachievement in reading, maths or science and the amount of financing allocated to primary and secondary education and social support for families and children. It should be noted that in this equation, variables OBPPEd are OBFC are excluded due to their statistical insignificance and immaterial influence on the response variable:

$$UrSt = 33.02 - 2.11 \cdot LBPPEd - 4.87 \cdot LBSEd - 3.34 \cdot OBSEd - 1.9\, LBFC \quad (1)$$

Model (1) indicates that factor variables produced an inverse effect on the dependent variable (*UrSt*), which explains its decrease when respective budget expenditures increase. The findings of the study corroborate the hypothesis that larger budget expenditures on pre-primary and primary education and expenditures on secondary education lead to a reduction in underachievement in reading, maths or science. In view of the nature of the study process, a larger impact on underachievement in reading, maths or science is produced by budget expenditures on secondary education. Thus, the coefficient of the impact of local budget expenditures on secondary education (LBSEd) is the highest, equalling (-4.87), whereas that of the respective expenditures of other budgets (OBSEd) is (-3.34). A noticeable effect on the reduction in underachievement in reading, maths or science is also produced by budget expenditures on pre-primary and primary education. At that, it is necessary to pinpoint that the inverse effect on underachievement in reading, maths or science (which equals (-2.11)) is produced only by local budget expenditures on pre-primary and primary education (LBPPEd). This can be explained by the efficiency of local government spending and its better adaptability to customer needs. Such results generally support the conclusions drawn by R. Cassen and G. Kingdon that poor achievement in primary school usually becomes an important driver of underachievement in further study [Cassen & Kingdon, 2007].

In result of testing the hypothesis that larger budget expenditures on social support to families and children produce an additional impact on the reduction in the level of underachievement in reading, maths or science, we have found that such impact is quite noticeable. However, the statistically significant dependence of the level of underachievement in reading, math or science is only observed for expenditures of local budgets on social support to families with children (LBFC), which is reflected in the value of the coefficient (-1.9). At that, the statistically significant impact of similar expenditures from other types of budgets on the response variable is absent. This allows us to underscore that

for the reduction of underachievement in reading, maths or science, it is not only the impact of budget expenditures on secondary education that is highly significant, but also local budget expenditures on pre-primary and primary education and social support to families with children.

It should be noted that the factors under study explain only 65% of the level of underachievement in reading, maths or science. However, this, in our opinion, can be considered as rather high level of impact since the process of knowledge absorption is subject to influence of not only the amounts of expenditures from different budgets allocated to primary and secondary education and social support to families and children, but other variables as well, such as, for example, social and psychological factors that can rarely be measured quantitatively. As for the researched model, we can assert that nearly 30% of the level of underachievement in reading, maths or science is caused by non-financial indicators. Since the constant indicates the value of response variable when factor variables equal zero, we can assume, based on Model 1, that nearly 33% of the level of underachievement in education is preconditioned by certain starting conditions, such as social, psychological and other unobserved factors mentioned previously.

However, public expenditures in various countries over different years can differ substantially. That is why, taking country-specific features into account, it is possible to identify latent factors across time periods and economic entities. At that, the model will take on the following form:

$$Y = \alpha + \beta X_{it} + d_t + f_i + \varepsilon_{it}, \ (i = 1, \ldots, 28; \ t = 1, \ldots, 11)$$

where α is a constant, β is the coefficient of the vector of common factor variables X_{it} observed for cross-sectional unit i over period t, i.e. the structure of variable $X = (x_{1.1}, x_{1.2}, \ldots, x_{1.11}, x_{2.1}, x_{2.2}, \ldots, x_{2.11}, \ldots, x_{28.1}, x_{28.2}, \ldots, x_{28.11})$, f_i expresses individual-specific time-invariant effects of economic entities; d_t denotes time effects that are constant for countries; errors ε_{it} represent independent and identically distributed random variables (across countries and across time). Dummy variables for each economic entity i are binary values, that is

$$z_{ij}^{f} = \begin{cases} 1, \ i = j, \\ 0, \ i \neq j. \end{cases}$$

Dummy variables for each time effect *t*:

$$z_{tr}^{d} = \begin{cases} 1, \ t = r, \\ 0, \ t \neq r. \end{cases}$$

Thus, in our case, the model of panel data with individual effects will take on the following form:

$$Y = \alpha + \beta X_{it} + \sum_{r=1}^{T} z_{tr}^{d} d_t + \sum_{j=1}^{N} z_{ij}^{f} f_i + \varepsilon_{it}, \ (T = 11, N = 28).$$

The fixed effects model is applied in order to take into account the unobserved factors, which are different for different moments in time. The fixed effect model is a model of linear regression, in which intercepts change across economic subjects *i*. This model has the same assumptions as in the regular linear regression model:

1. Factors X_{it} are independent from ε_{it} for all *i* and *t*.
2. Errors ε_{it} are independent and identically distributed random values with zero mathematical expectation and variance.

We can now construct a panel data model – the model with fixed individual-specific effects which represents the initial regression model modified in terms of deviations from time-mean variables. We can now estimate the regression model with fixed effects for the mentioned variables.

When constructing Model 2 with dummy variables, which enable us to account for individual effects, the coefficients of the model did not differ significantly from those used in Model 1, demonstrating the same nature of influence on the dependent variable. The latent variables of individual-specific effects across economic entities (countries) were abandoned due to their colinearity, whereas the impact of time effects was somewhat different in nature: Some reduction in the level of underachievement in reading, maths or science was observed in 2003 and 2006, while the maximum fixed time effect was observed in 2009 (d_{t3}).

Table 4. Values of time variables in Model 2 "The relationship between the level of underachievement in reading, maths or science (UrSt) and factor variables, taking into account individual effects»

Variables	d_{t1}	d_{t2}	d_{t3}	d_{t4}	d_{t5}
Years	2003	2006	2009	2012	2015
Coefficient of time effects	−0.20	−0.01	0.36	0.27	0.09

Source: based on data by Eurostat: https://ec.europa.eu/eurostat/data/database

Variable d_{t3} indicates that in 2009 a weakening could be observed in the relationship between the level of underachievement in reading, maths or science and the factor variables described in Model 1. A comparatively larger value of the time effects coefficient for this year can be explained by abnormal dynamics of public expenditures in 2009, caused by the world financial crisis. However, the return of the time effects coefficient to the pre-crisis levels after 2009 proves that the model is robust in explaining the persistent impact of the social expenditures of local budgets on underachievement in reading, maths or science.

Analysis of the dependence between the percentage of children at risk of poverty or social exclusion and the social expenditures of local budgets

Social budget expenditures usually produce a broad spectrum of effects on social relations. In view of the fact that underachievement in education is often connected with poor social conditions of households, as well as the fact that accessibility to education services often affects the life-activity of households in general, it is important to investigate the dependence between the risk of child poverty (*ChRPSEx*) and the budget expenditures on education.

It is necessary to note that we studied state budget expenditures on social protection of family and children as one of the factor variables. Although it was found that such expenditures lead to reduction in the level of underachievement in education, it is also important to analyze their impact on the reduction of the share of children at risk of poverty as an important determinant of the attainment of sustainable development goals.

In order to study the impact of factor variables on the level of children at risk of poverty or social exclusion indicator, we consider it feasible to develop a model with fixed individual-specific effects (Table 4) by taking the initial regression model and rewriting it in terms of deviation from time-mean values of variables. This will allow to fully take into account the dependence of the children at risk of poverty or social exclusion indicator on the time period and the country. In the developed model, due to collinearity, we excluded 29 dummy fixed unknown variables, f_i *(i = 1,…, 28)* denotes the effect of a separate country, and d_{11} represents the latent effect for the year 2018.

Table 5. Model 3 «The relationship between children at risk of poverty or social exclusion and factor variables, taking into account individual effects», $R^2 = 0.922$[18]

Variables	Coefficient	Std. Deviation	t-Statistics	p-Value
Const	25.75	2.89	8.883	1.69e-09 ***
LBPPEd	−2.16	1.93	−2.110	0.027**
OBPPEd	1.91	3.64	1.5233	0.06*
LBSEd	2.58	2.71	2.9515	0.03**
OBSEd	−1.46	1.08	−1.351	0.018**
LBFC	−4.38	1.62	−2.699	0.006***
OBFC	0.21	1.68	0.1223	0.9

Note: The table shows values for observed factors, whereas coefficients for latent variables are not shown.

Source: based on data by Eurostat: https://ec.europa.eu/eurostat/data/database

The R^2 value indicates that the obtained model describes 92% of the response property after individual-specific fixed time effects have been taken into account. Since all indicators of the model vary in time, we estimated the coefficients for each of them. That is, the impact of the factors on the response variable is time-invariant. The coefficients for all indicators except OBFC are statistically significant and, according to the results of the fixed effect model, these factors produce an effect on the level of children at risk of poverty indicator:

$$(3) \qquad ChRPSEx = 25.75 - 2.16 \cdot LBPPEd + 1.91 \cdot OBPPEd + 2.58 \cdot LBSEd - 1.46 \cdot OBSEd - 4.38 \cdot LBFC$$

Among the studied impacts of factor variables on the children at risk of poverty or social exclusion indicator, we can single out the adverse impact of local budget expenditures on social protection of families and children (LBFC), estimated to equal (-4.38). This is explained primarily by the direct purpose of such expenditures which consists in preventing the poverty of households. At that, we can observe the absence of a statistically significant relationship between the state budget expenditures on social protection of families and children and the percentage of children at risk of poverty or social exclusion. This is preconditioned by the fact that households usually do not receive their social support directly from the state and regional budgets; these resources are mainly used to finance measures, the participation in which can hardly be differentiated based on the beneficiaries having particular poverty characteristics. A much higher impact of local budget expenditures

[18] The number of observations was 308. The number of cross-sectional units is 28. Length of the time series is 11 years.

on the reduction of the percentage of children at risk of poverty or social exclusion reflects the high level of local budget resources allocation to social protection of families and children.

In Model (3), we can observe that the impact of budget expenditures on the percentage of children at risk of poverty or social exclusion is non-homogeneous. This is caused primarily by the fact that the main task of public education financing is to ensure equal access to quality education services for all children. At that, worth acknowledging is the positive role of local budget expenditures on pre-primary and primary education (LBPPEd) and of the state and regional budget expenditures on secondary education (OBSEd) for reducing the share of children at risk of poverty or social exclusion. Therefore, we find only partial support for the hypothesis that larger public expenditures on pre-primary and primary education, secondary education and social support of families and children have a significant effect for decreasing the risk of child poverty.

The Fisher criterion shows that the coefficients are non-zero in all the models. The Fisher criterion for effects also shows that they are other than zero. The *t*-criterion above 1.96 (at 95% confidence level) for all statistically significant coefficients indicates that respective variables are relevant.

It should be noted that the Fixed Effects Model 3 also involves the determination of the effects of specific time points: By introducing dummy variables for each time point, we managed to estimate the influence of each time period on the level of child poverty and the degree of significance of the processes taking place during separate time periods (Table 6).

Table 6. Values of the time variables in Model 3 "The relationship between the level of children at risk of poverty or social exclusion and factor variables, taking into account individual effects"

Variables	d_{t1}	d_{t2}	d_{t3}	d_{t4}	d_{t5}	d_{t6}	d_{t7}	d_{t8}	d_{t9}	d_{t10}
Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Time effect coefficient	1.81	2.99	3.81	4.16	4.75	4.81	4.01	3.44	2.66	1.07

Note: All estimates d_{ti} were statistically significant at the 1% level.

Source: based on data by Eurostat: https://ec.europa.eu/eurostat/data/database

The obtained values for d_{t6} and d_{t5} are the largest and positive, which allows us to conclude that the magnitude of the time effect was the largest during the years 2012 and

2013; at that, an increase in the level of child poverty during these years was larger compared to other years.

Conclusions

The performed empirical research based on the official data for 28 countries of the European Union, encompassing the period from 2007 until 2018, allowed to determine the dependence between students' underachievement in reading, maths or science and social expenditures of the budgets. We found that countries with larger expenditures of both local budgets and state and regional budgets on secondary education face less problems with underachievement in reading, maths or science (the coefficients of dependence equalled (–4.87) and (–3.34) respectively). The additional negative effect on the decrease in this phenomenon is produced by expenditures of local budgets on pre-primary and primary education (the coefficient of dependence equal to (-2.11)) and expenditures of local budgets on social protection of families and children (-1.9)). The obtained results were statistically significant, which is proved by the 99% confidence level for model parameters.

In the countries of the European Union that had larger expenditures of local budgets on social protection of families and children, the level of children at risk of poverty or social exclusion indicator was lower (coefficient of dependence equal to (-4.38)). Expenditures of different types of budgets on education produced mixed impact on the response variable. Negative impact on the children at risk of poverty or social exclusion indicator was produced by expenditures of local budgets on pre-primary and primary education (coefficient of dependence equal to (-2.16)), as well as expenditures of the state and regional budgets on secondary education (coefficient of dependence equal to (-1.46)). This supports the thesis that local budget expenditures on social protection of families and children play an important role in the reduction of underachievement in reading, maths or science, as well as in the reduction of the percentage of children at risk of poverty or social exclusion.

The performed study of the dependence of students' underachievement in education and the percentage of children at risk of poverty on social expenditures of local budgets based on panel data for the EU countries generally proves the existence of the positive impact of local budget expenditures on the attainment of sustainable development objectives. The prospects for future research in this direction consist, in our opinion, in performing a more

detailed investigation into the connection between budget expenditures and the progress in SDG attainment. In view of the above, it is worth to focus on detailed analysis of the dependence between the results of public goods provision and the volume of public financing. For that, the researchers can apply experiments, in the process of which the participants will be modelling the behaviour of economic subjects, in particular the process of public goods provision. This will allow to study the nature of the influence of budget financing on the public goods provision and the implementation of SDG objectives.

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Naming of educational organizations as a marketing tool

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Abstract: This research focuses on building the brand of an educational institution. An important attribute of the brand is the name. The purpose of the article is to analyze and evaluate the methods of creating the names of private secondary schools, to identify the frequency of their use. The material base of the research is a card index of names of private educational institutions of the middle level, formed by the author in the process of research by a continuous sample of names. A total of 194 names were analyzed and systematized.

The stages of creation of a name of an educational institution are considered. The requirements for a successful name of an educational institution are characterized. It is established that in Ukrainian education, naming has not yet become a common marketing tool. Only private educational institutions have mastered the methods and principles of naming, given the market of educational services and the possibility of its segmentation. The study describes 9 preferred methods of creating the names of secondary schools, including private schools. The most common are the associative method, based on the construction of certain positive connotations associated with the name of the institution, and the reference method.

Nominal, appellate and conceptual methods, names of flora, fauna, natural phenomena are also often used. The results of the study show that the modern names of educational institutions are dominated by names of the pragmatic type. Whereas, the small number of non-pragmatic non-informative nominations is due to the fact that in conditions of high competition, names with a value that is not supported by an indication of the type of activity of the institution will not be remembered by the consumer. Prospects for further research of the names of educational institutions in terms of communicative-functional approach are proposed.

Key words: educational marketing, branding of educational institution, naming, name of educational institution.

JEL: Z13, Z33

Introduction

Education is an integral part of most economic and social processes taking place in modern society, is an important factor in the creation and formation of human capital and welfare of the state, which, in turn, increases the need for highly qualified professionals. In such circumstances, marketing is designed to bring the market of educational services in line with the requirements of the times.

Today, for many specialized institutions, marketing is still not a priority. At the same time, the use of effective management methods in the field of education is of great interest. The high pace of development of the market of educational services has led to increased competition. In view of this, educational institutions must improve the organizational and economic mechanisms of their operation, using sound management and marketing approach in their activities [Teletova, 2011].

Theoretical and practical aspects of marketing in the field of Ukrainian education are just unfolding.

The development of society depends on educational services, so the state is interested in their quality. Features of educational services are: they contribute to the formation of human capital; are produced and consumed simultaneously; are provided to the consumer without intermediaries; a certain set of qualities must be inherent in the student.

Recently, in the economic literature, special attention is paid to the branding of educational institutions: the study of branding in education, the need to form and maintain a brand of higher education, modern brand technologies in education, the positioning of the institution in the market of educational services through its brand, the impact that branding of an educational organization has on its image, rebranding of educational institutions [Bansal, 2014; Freeman et al., 2017; Keller, 1998; Reynolds, 2017].

Branding, according to many researchers, is the most effective means of marketing communication [Chiranjeev et al., 2005]. Branding in the field of education performs many functions, making life easier not only for the educational institution, but also for the end user of educational services - students and their parents. Consumers can choose the educational institution themselves, and branding is the communication tool that helps the consumer to make a decision in favor of another educational institution.

Attributes of brands of educational institutions are: name, the prestige of the educational institution, curriculum; location, recommendations, affordable tuition, teaching staff, training schedule, international relations. The name gives life to the brand. The right name always attracts the attention of the target audience, creates a positive brand image. Professional naming will help to take the lead position of the educational brand even in conditions of high competition. The name, like the logo and corporate identity, becomes the basis of the brand, and even a slight transformation of the brand can change its image, linguo-functional meaning.

The purpose of the article is to analyze and evaluate the methods of creating the names of private secondary schools, to identify the frequency of their use; to assess the effectiveness of the names of secondary educational institutions in the system of forming and promoting brands in the educational sphere.

Literature review

Today, Ukrainian educational institutions are forced to operate in a market system: the birth rate has declined due to the economic situation in the country against the background of an increase in the total number of educational institutions, including private ones. In this situation, one of the main tools of educational institutions in the struggle for the consumer of services is branding, a component of which is naming.

Naming was formed in economically developed countries in the late XIX century, when with the development of science and technology, the growth of production in the market increased the same type of products, which led to fierce competition and the need to distinguish goods by name. According to experts in economics, marketing, brand management, branding, a commercial name should not be accidental and should have important properties.

Experts advise to follow the following rules of naming an educational institution [Douglas et al., 1995; Madieva, 2020; Robertson, 1989; Sankrar et al., 1999; Xiaopeng et al., 2020]:

1. The name must be unique, distinguish the educational institution from competitors, have no analogues.

2. The name should contain a hint at the advantages of educational services, guarantee their quality.

3. The name should be as short as possible in sound, easy to remember and easy to pronounce. It is important to avoid complex letter and sound combinations.

4. The name of the educational institution should evoke positive emotions in the consumer of educational services.

5. The name should be universal, because it will need to be translated into a foreign language and its sound should be adequate and not cause negative emotions in other languages.

6. The name of the educational institution should contain the promise that consumers can count on. The name should reflect the description of the activity.

Another approach to the development of a commercial name involves:

Market research. The generation of neem should begin with a comprehensive study of the market in which the brand will move, as well as with a study of the nature of goods and

services that will be offered under this name. These measures should include: first, the analysis of the offered services (purpose, quality, benefit, etc.); secondly, competitive analysis (price category, positioning); third, the study of consumer behavior (preferences, lifestyle, consumption situations).

Approval of substantive and formal requirements for name. The name of the educational institution is one of the most important communicators, so it is desirable that it provides key information to consumers, ie be motivated [Kroskrity, 2021].

The development of the name of the educational institution contains the following steps [Alikperov, 2018]:

1. Development (refinement) of the development strategy of the educational institution and the marketing plan. It is necessary to determine the strategic goal of development (strategy of product portfolio development, its level and differentiation, value and degree of novelty, for which target audience they are intended, what market share of services the institution claims, etc.). opportunities, but also pay attention to global trends and prospects for the development of the industry market.

2. Analysis of the competitive environment to identify the strengths and weaknesses of the educational institution and possible ways of its development. This will help to take into account market trends and opportunities for the promotion of the educational institution, its separation from competitors, identifying the demands of potential consumers of educational services and possible approaches to the development of the name.

3. Identification of potential consumers of educational services taking into account demographic, social, personal and psychological factors.

4. Development of the concept and variants of the name of the educational institution. At this stage, it is advisable to use logical and intuitive approaches to creating a name. Logical methods (morphological and problem analysis) should be used at the initial stage of name creation. Intuitive methods ("brainstorming", "635", synectics, etc.) are more rational for the creative process, when you need to determine the breadth of the search for the name, choose one of the approaches to the name, create a name that will help determine the profile of the institution, distinguish it from competitors, ensure the promotion of both the institution and its services. Check control will assess the main idea of the brand, its value to consumers, to form emotional and logical components of the name.

5. Coordinating the name with the management or founders of the educational institution, who have their own ideas about the concept and visualization of neem.

6. Verbalization and visualization of the name for its further promotion on the target market. Verbalization is not just about creating a name that can be protected by copyright. It is also the development of a language of communication: manners of communication, style of writing and conversation.

7. Testing of the developed name to identify potential consumers' attractiveness, interest, understanding, recognition, memorization, pronunciation, stand out from the competition, as well as clear from the name of the benefits and value of the services of the educational institution. Then make adjustments or in the name.

8. Trademark registration.

9. Evaluating the effectiveness of the name on the market of educational services. This is the final stage of naming. The evaluation will determine whether the goals set at the beginning of the project have been achieved.

The name of the educational institution in a competitive environment as a tool of advertising influence on the consumer audience [Chan et al.,1997].

Methodology

Evaluation of the effectiveness of naming in the educational environment involved the following stages:

Stage 1. Review of the market in the studied category.

This stage is focused on studying the market at a certain point in time. A list of items in a certain category is compiled using a continuous selection method. This makes it possible to see at a glance which names are already on the market.

Stage 2. Determination of methods of formation of the name of each company in the studied category.

For this stage, it is necessary to study in detail the methodology for creating naming. This approach helps to identify the direction in which a copywriter, a naming specialist needs to move to create a unique positioning.

Stage 3. Communicative analysis of names.

At this stage, a survey of respondents was conducted. The questionnaire contained questions related to associations, emotions, motives for buying, as well as the essence of the brand, its positioning.

To implement the purpose of the study, the following methods were used: general - analysis and synthesis, study and generalization of existing experience on branding in education; descriptive method - for inventory, classification, systematization and interpretation of proper names in synchrony; method of associative-conceptual analysis - to clarify the dominant meanings of the names of educational institutions; statistical method for establishing the frequency of use of a certain method of creating the names of educational institutions; pragmatic analysis of communications - for the reconstruction of nominative strategies and motivations during the creation of names. The survey method was used to identify the attitude of heads of educational institutions to the branding of educational institutions and to study the associations, emotions evoked by the brand, reflecting the essence of the brand through the name and the evoked desire to make a purchase.

Results

In the system of Ukrainian education system, naming has not yet become a marketing tool. Only private educational institutions have a special approach to naming, given the market for educational services and the possibility of its segmentation. Other educational institutions follow the old vintage approach. Usually their names contain the following components:

- geographical part (western Ukrainian, Kyiv);
- organizational and legal form of the institution (regional, regional);
- sectoral approach (pedagogical, agricultural, humanitarian);
- level of education (preschool, general, incomplete higher, higher);
- type of educational institution (preschool, general education, professional, organization of higher education, as well as organization of additional education);
- type of educational organization (for secondary - school, lyceum, gymnasium; for professional - professional lyceum, technical school; for higher - college, institute, university);
- numbering (for secondary, professional, preschool institutions).

76 heads of secondary schools were interviewed in order to study their attitude to the naming of educational institutions. The majority agreed with the need to rename educational institutions (84% of respondents). Among the reasons for renaming are: competition in the market of educational services - 89%; distinction from competitors and clear positioning - 76%; compliance with the demands of consumers of educational services - 54%.

According to the respondents, the most successful names of educational institutions are: associative names - 68%; proper names, in particular the names of famous educators - 58%; neologisms - 47%; foreign words - 39%.

We have compiled a list of Ukrainian private schools using the service osvita.ua. To create a name, the owners of an educational institution must answer the following questions: what is the purpose of the educational institution; what is the target audience; what should the name convey to consumers of educational services.

The object of the study were the names of 194 Ukrainian private secondary schools. As a result of the analysis of the names of secondary educational institutions, in particular private schools, 11 main methods of their formation were revealed (Table 1).

Table 1. Basic methods of forming the names of private schools

Name formation method	Explanation	Example
Associative method	Using associative series words, which in the minds of consumers are associated with the object of naming	Prestige, Future School of Technology, Intelligence, Innovator, Professional, Prospect, Erudite, Leader, Gravitation, Iamb
Reference method	Using the name of a product that is the leader in the category, its easy to change; use of foreign names that reference its country origin	British International School, Open European School, International Academic School, International Innovation School, Innovative lyceum, Futurum Children's Academy, Ukrainian Global School, Astor School, Inventor School, Elite Digital English School, iQschool, Creative School, Capital Union School, Eruditus School
Nominal method	Usingsurnames or names. One of the oldest and most popular methods of creating names	Humanities profile lyceum named after Hai-Mushka Schneerson, Boiko School, School-gymnasium of St. Sophia, Kostandi, Private schools of Elena edernikova
Appeal method	Using names that appeal to the feelings and emotions of the target audience	The beginning of wisdom, The Living Word, At the Crossroads, The Future, Veda, Ascent, Harmony, Dream school, Path, Good school, The new generation, Dream, Creating a

		personality, Without borders, Wings, School of Our Dream, The key
Conceptual method	Reflecing the uniqueness of the institution	Elite Digital English School, Ukrainian Global School, Future School of Technology, Kingdom Family School
Names of flora, fauna and natural phenomena, geographical names	The semantics of the names of flora, fauna and natural phenomena or geographical names allows to create vivid images for brands	Apricot, Seagull, September, Papaya School, Atlantic School
Hybrid method	Formed from an original phrase; the words seem to overlap, which creates a game effect	Єvrolend, Marmelandiya, Divosvit, Ekolend, Interaktiv, EdKids
Abbreviation method	Creating a name using abbreviations	DEC life school (development, education & culture), NSS school (NEW SCHOOL OF SCIENCE)
Method of neologisms	A method that allows the use of educational naming neologism - a word or phrase that has recently appeared in the language	Rikiki

Source: own work

According to the results of the study, educational institutions most often use the associative method, which is based on the construction of certain positive connotations associated with the name of the institution. This method accounts for 26% of all names. The second most frequent (25%) method of creating names of educational institutions is the reference method. Nominal (17%), appellate (16%) and conceptual (6%) methods, names of flora, fauna, natural phenomena (5%) are also common. The abbreviation method and the method of neologisms are used in isolated cases, from 1% to 3%. Of course, the range of naming methods is not limited to the methods described above.

Based on the presence / absence of pragmatics in the names of private schools, we have developed a classification of names of educational institutions:

1. Non-pragmatic. 1.1 informative - directly indicate the scope of activities of the institution: Montessori School of the New Age, World School, Gymnasium A +, Innovative Lyceum, French Private School, Open European School, International Academic School; names characterized by a high degree of informativeness: Creative International Children's School, European Collegium, Miniboss Business School; 1.2 non-informative - do not contain any information about the educational institution, understandable without deciphering. Such names are divided into two types: one includes names that are not associated with

educational institutions: Chaika, Parus, Meridian; the other consists of neologisms, such as Rikiki.

2. Pragmatic. This group includes names in which the speech influence on the addressee is pronounced. The group of pragmatic names is divided into two subgroups: 2.1 pragmatic informative - contain additional information about the educational institution, which is not directly related to its activities, but creates a positive image of the institution in the imagination of the addressee. For example, this could be information about the location of the school Advance Green school (school located in the woods), Novopechersk school. In addition, the name may specify the direction of the institution: Elite Digital English School, Future School of Technology; 2.2 pragmatic associative – which do not directly reflect the specifics of the educational institution, but seek to influence the consumer through the associative background created by the name. area list of most of these names is as follows: Intelligence, Innovator, Professional, Perspective, Scholar, Leader.

At the last stage of the study, the respondents were asked the following questions:

1. Your gender;
2. How old are you ?;
1. Which of the following names do you associate with the field of education ?;
2. What emotions does each name evoke in you ?;
3. What is the first name that comes to your mind when it comes to teaching?;
4. Do you think each name reflects the essence of the brand?
5. Which name makes you think about studying in this institution?

Among 140 respondents, 90 female and 50 male respondents took part in the survey. 78% of respondents are 12-17 years old - students who act as the core of the target audience of the educational services

The second place is taken by respondents aged 34 to 52 years. The target group in this segment are parents of schoolchildren, who also have a significant influence on the choice of an educational institution by a child.

As shown by the survey, the names of which include such components as school, lyceum, academy are ssociated by more respondents (81% of the respondents) with the field of educational services: British International School, Open European School, International

Academic School, International Innovation School, Innovative lyceum, Futurum Children's Academy. Does not cause associations associated with the field of education, such names: Євrolend, Marmelandiya, Rikiki (62% of the respondents).

The following names evoke positive emotions among the respondents (57% of the respondents): Prestige, Intelligence, Innovator, Professional, Prospect, Erudite, Leader, Iamb, Євrolend.

To a greater extent, the respondents are forced to think about studying at this school by such names as Future School of Technology, Erudite, Inventor School, Elite Digital English School, iQschool (68% of the respondents). Least of all the respondents want to study at (79% of the respondents) Papaya School.

The results of the survey show that the most effective principles for the nomination of educational institutions are informative and associative.

Summary, recommendations

Thus, marketing in the market of educational services is a socially oriented process that helps increase the competitiveness of educational institutions through wider and better meeting the educational needs of customers: the individual - in education, enterprises and organizations - in increasing human potential, society - in reproducing personal and intellectual potential. Achievement of this goal requires the cooperation of all parties.

Competitive environment and equal status of educational institutions at all levels, regardless of ownership, encourage owners and top management to seek new forms and ways to gain the trust of consumers of educational services.

The most effective means of marketing communication is branding. One of the external attributes of the school's brand is the name. The task of naming in the field of education creating a positive image of the educational institution that will reflect all the values and benefits of the brand consciousness of the target audience.

The use of naming principles in the activities of educational institutions is a new and necessary step in the market economy. However, in Ukrainian education, naming has not yet become a marketing tool. Only private educational institutions are aware of the importance of this verbal means of communication, given the market for educational services and the possibility of its segmentation. The active and professional use of these principles by private

secondary schools testifies to the relevance of naming as an effective tool for promoting educational institutions and educational services.

The name of an educational institution should be accurate and meaningful, associated with the following categories: the idea of positioning the institution; the essence of the brand; the main difference from competitors; the main benefit or advantage for consumers of educational services; the result from feedback received by the consumer; purpose of the service; main aspects of quality assurance; design features of educational institution and educational services; the main value of the brand from the point of view of consumers; style and standard of living of the consumer; factors that motivate consumers to choose this educational institution; price category.

As a result of the analysis of the names of secondary level educational institutions, in particular private schools, the main methods of their formation are revealed. The most common are the associative method, based on the construction of certain positive associations associated with the name of the institution, and the reference method. Nominal, appellate and conceptual methods, names of flora, fauna and natural phenomena are also often used.

A study of modern nominations of educational institutions showed the predominance of pragmatic names. The small number of non-pragmatic non-informative nominations is due to the fact that in conditions of high competition, names with a value that is not supported by an indication of the type of activity of the institution will not be remembered by the consumer.

Prospects for further research are the study of the names of higher education institutions in terms of communicative-functional approach in the field of cognitive linguistics as a segment of onomasic space.

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Analysis and recommendations for improving financial reporting – a case study of the Serbian company "Nectar"[19]

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Abstract: This paper presents, in the form of a case study, the process of analysis of financial statements of the business entity "Nectar", which engaged in the processing of fruits and vegetables in the Republic of Serbiais (a country with a very large agricultural potential). The time aspect of the research covered the period 2015-2018. The aim of this paper is to evaluate the past achievements of the company and predict future achievements in the function of supporting the decision-making process. Furthermore, the aim of the research is to assess the financial result and financial position of a given company through the analysis of the structure and dynamics of total income and the distribution of total income, profitability and opportunities to improve the financial position. Quantifying the functional relationships that exist between balance sheet items is the goal of enabling a credible assessment of the financial position. The results indicate that "Nectar" operates stably in the observed period; furthermore, there was an increase in short-term placements, as well as capital items. The trend of business revenues shows moderate stagnation, with the largest gain in 2017. Finally, it was concluded that there is room for export activities, since revenues in the country are about 30% higher than revenues abroad, so one of the resulting recommendations is to turn to export activities.

Key words: financial analysis, balance sheet, income statement, "Nectar" company, Republic of Serbia, financial reporting

JEL: Q14, M41

Introduction

Financial analysis deals with the research and quantification of the functional relationships that exist between balance sheet items, balance sheets and success, with the aim of enabling a credible assessment of the financial position and activities of the company [Dimitrijevic, 2015; Anar, 2019]. Generally speaking, the analysis of financial statements is an assessment of the past achievements of the company and the prediction of future achievements in the function of information support to the decision-making process, which

[19] The paper is part of the COST action CA19130 called FinAI – *Fintech Artificial Intelligence in Finance – Towards a transparent financial industry*.

are essentially financial decisions. The purpose of financial reporting is to provide all stakeholders (stakeholders) with information on the yield, assets and financial position of the company, as well as changes in those positions. In this regard, the financial condition of the company is of interest to all its stakeholders [Janvrin et al., 2017; Milacic et al., 2013]. This paper presents, in the form of a case study, the process of analysis of financial statements of the business entity "Nectar". The paper consists of four parts. The first part gives the theoretical assumptions on which the work is based; the second part presents the methodological framework of the work; the third part presents the results of the research, while the fourth part of the paper consists of the conclusions derived from the paper. The subject of the paper is the analysis of the official financial reports of the limited liability company "Nectar", using the basic ratios of indebtedness, liquidity and profitability. In order to make the analysis more detailed and precise, we will use balance sheets in the period from 2015 to 2018. The very subject of this research has gained importance at this time because quality interpretation provides an opportunity to see the general financial situation in the Republic of Serbia.

Theoretical premises

If we say that the subject of analysis is the balance sheet and income statement, then the goal of any balance sheet analysis is the analysis of financial results - including the structure and dynamics of total income and distribution of total income, sources of financial results, profitability, risk of financial results, as well as an analysis of the financial position, which includes analyzes of long-term and short-term financial balance, reproductive capacity, indebtedness, maintaining the real value of equity and the possibility of improving the financial position. These could be the general objectives of the analysis that financial analysts observe and study [Vidakovic & Petrovic, 2013]. Among the specific goals, we will single out: meeting the needs of stakeholders, analyzing future trends, evaluating the performance of companies, using accounting information to make decisions, determining company policy measures, etc. [Sevkusic, 2018; Vesic et al., 2020]. Financial statements are a direct product of accounting reporting systems that, in essence and purpose, reflect the company's performance for a certain period of time, its financial and structural position, as well as the position of liquidity on the selected balance sheet date [Karim & Suh, 2018]. The main purpose

of their compilation is reflected in the information service of various interest groups that rely on them in the process of making important decisions. As such, they are prepared and presented at the end of the business year, with the possibility of semi-annual or quarterly reports. A financial report is a set of reports on the financial strength and financial position of a particular legal entity. In Serbia, a set of forms is prescribed, which is a regular annual financial report [Vojinovic & Vukasinovic, 2012]. In accordance with the Law on Accounting, these are:

- The balance sheet is a financial report on the balance of assets (assets) and sources of assets (liabilities) on a particular day.
- The income statement is an independent part of the balance sheet, the position of capital in which expenses and income are located in order to establish a profit or loss.
- The statement of cash flows is compiled from the same information as the balance sheet and income statement in order to show all cash inflows and outflows during a certain period.
- The report on changes in equity tells what happens to capital in one time period, i.e., why there was an increase or decrease in capital.
- The other result report is the youngest financial report. It arose as a result of the application of IAS 1 and the amendment of this standard, which requires the presentation of the positions of other capital-related results.
- The notes to the financial statements accompany the above statements and explain them in detail.

Legal regulations stipulate the obligation to compile and publish financial reports. Financial reporting consists of presenting information on the financial position presented in the balance sheet, presenting information on business performance given in the income statement, as well as presenting information on changes in capital and cash flows during the observed reporting period [Vesic & Barjaktarovic, 2020]. The financial report on the business of a company at a certain moment is usually the basic source of information for successful or unsuccessful business of a company [Hopper et al., 2017]. Each of the individual reports presents information that is different from the information presented by other reports, but they are all related and actually represent different aspects of the same thing [Lazic, 2018].

Pre-accepted and recognized accounting standards determine the structure and content of financial statements, as well as the rules for presenting, recognizing and measuring all elements in financial statements. In Serbia, as in most small countries that do not have their own rules, financial statements are compiled according to international financial reporting standards [Jevtic & Vesic, 2019; Tianjing et al., 2017].

Methodology

"Nectar" company was chosen as the subject of analysis as a company that deals with the production process, from cooperation with fruit growers and the purchase of fruit to finished products: juices, nectars, alcoholic beverages, jams. This paper can be used for scientific purposes, due to the systematic presentation of the business analysis procedure of the company from the financial statements, as well as for social purposes, bearing in mind the importance of the company for the economy of the Republic of Serbia. It is especially important that in the Republic of Serbia, as a country with a very large agricultural potential, companies engaged in the processing of fruits and vegetables operate successfully. The aim of the research is to assess the financial result and financial position of a given company by examining the structure and dynamics of total income and the distribution of total income, as well as profitability and opportunities to improve the financial position. Based on the income statement schemes, we will assess the quality of the profit and where it comes from as much as possible, in order to indicate potential ways to increase “Nectar's” performance in the future.

The paper starts from the general hypothesis that the company "Nectar" operates stably in the observed period. Special hypotheses were added to the general hypothesis:

1. Positive business is expected in the coming period as well.
2. The amount of total revenues recorded a slight increase in the observed period.
3. There is a proctor to increase business in foreign markets.
4. "Nectar" is one of the socially responsible companies.

The scientific goal of the research is to point out the importance of financial reporting of companies, the relationship between the positions of financial statements (ratio indicators), from the point of view of decision-making on the issue of entering into business and financial relations. The social goal of the research is to calculate and interpret the

mentioned indicators and planned balance sheet positions from the company's point of view, in order to support the decision-making process on entering credit and other financial positions in the future. The importance of the research is in a closer understanding of the interpretation of the analysis of financial statements for financial planning, while the relevance of the research lies in the fact that it is very important to monitor the business of companies engaged in production activities [Kryszak & Staniszewski, 2018], which relate to fruit and vegetable processing agricultural areas of high natural value. This is exactly what the Environmental Protection Agency of the Republic of Serbia identified in 2010.

Results

The company's assets are visible in the balance sheet [Konstantinos et al., 2020]. It shows what the company owns, as opposed to liabilities showing where those funds come from [Popovic et al., 2018]. The assets of an enterprise constitute is included in the analysis of financial statements in the analysis of assets. The analysis of the structure of total assets divides the assets into: unpaid subscribed capital, invested capital, operating assets and loss above the amount of capital, i.e., in one word business assets. Operating assets are further divided into fixed assets and current assets. Table 1 also shows the balance sheet items (assets and liabilities) for the period 2015-2018 according to the data from the site of the Agency for Business Registers of the Republic of Serbia.

Table 1. Balance sheet assets of "Nectar" for the period 2015-2018

POSITION	STRUCTURE (%)				INDEX		
	2018	2017	2016	2015	2018	2017	2016
FIXED ASSETS	51,31	51,78	51,92	51,62	1,11	1,05	1,02
Intangible assets	0,13	0,03	0,09	0,008	17,9	4,4	1,23
Property, plant and equipment	16,22	15,08	13,92	13,12	1,38	1,21	1,08
Long term investments	34,91	36,63	37,87	38,45	1,01	1,004	0,99
Long-term receivables	0,05	0,04	0,04	0,04	1,38	0,89	0,93
CURRENT ASSETS	48,69	48,22	48,08	48,38	1,12	1,05	1,01
Supplies	28,39	30,45	30,14	29,07	1,09	1,1	1,05
Short-term receivables	11,82	12,46	10,51	10,88	1,21	1,21	0,98
Short-term financial investments	0,04	0,01	0,01	0,07	0,6	0,23	0,19
Cash equivalents and cash	7,7	4,21	6,21	7,67	1,12	0,58	0,82
Value added tax	0,02	0,23	0,54	0,25	0,1	0,99	2,17
Active accruals	0,71	0,86	0,67	0,44	1,78	2,03	1,52
Total assets	100	100	100	100	1,11	1,05	1,01

OFF-BALANCE SHEET ASSETS							
POSITION	**STRUCTURE (%)**				**INDEX**		
	2018	**2017**	**2016**	**2015**	**2018**	**2017**	**2016**
CAPITAL	50,25	50,91	47,25	43,95	1,27	1,22	1,09
Basic capital	0,77	0,82	0,85	0,85	1	1	1
Reserves	0,04	0,04	0,04	0,04	1	1	1
Revaluation reserves				2,71			
Unrealized losses	*0,004*	*0,004*	*0,004*	*0,05*	0,08	0,08	0,08
Retained earnings	49,44	50,05	46,36	40,35	1,36	1,31	1,16
LONGTERM RESERVATIONS AND OBLIGATIONS	20,46	21,97	27,99	30,52	0,74	0,76	0,93
Long-term provisions	0,27	0,27	0,16	0,21	1,36	1,28	0,74
Long-term liabilities	20,19	21,7	27,83	30,31	0,74	0,75	0,93
DEFERRED TAX LIABILITIES	0,23	0,33	0,35	0,45	0,58	0,77	0,81
SHORT-TERM LIABILITIES	29,06	26,79	24,41	25,08	1,29	1,13	0,99
Short-term financial liabilities	14,38	11,32	8,61	8,53	1,88	1,39	1,02
Advances received deposits and bails	2,53	1,48	2,28	4,22	0,67	0,37	0,55
Business duties	10,53	12,69	11,57	10,67	1,10	1,25	1,10
Other short-term liabilities	0,89	0,79	1,63	1,35	0,74	0,62	1,23
Tax liabilities	0,04	0,13	0,04	0,03	1,54	4,87	1,21
Accrued expenses and deferred revenue	0,69	0,38	0,28	0,28	2,70	1,43	0,98
LIABILITIES	100	100	100	100	1,11	1,05	1,01
OFF-BALANCE SHEET LIABILITIES	4,27	**5,03**	**3,51**	1,99	**2,38**	**2,65**	**1,78**

Source: own study, based on: (http://wwwhttp://pretraga3.apr.gov.rs/pretragaObveznikaFI, retrieved on November 27th, 2019)

Summary

The company "Nectar"is one of the largest processors of fruits and vegetables in the Republic of SerbiaThanks to their marketing slogan, "it doesn't matter" (which in a short time became one of the most famous and popular slogans), "Nectar" has become one of the most recognizable brands on the shelves of all small and large stores, markets and supermarkets. Through many years of work and very frequent innovations, the company has gained a leading position on the market of the Republic of Serbia, and we believe that the reputation and tradition oblige them to create and nurture the position even more.

The paper performs a financial analysis, based on publicly available data, and we can report conclusions that support the general hypothesis that reads: “The company "Nectar"

operates stably in the observed period". As a consequence of innovations, marketing activities and socially responsible business, the analysis of the balance sheet led us to the conclusion that in the observed period, there was an increase in intangible assets, while the company's fixed assets did not change much in the observed period. Through various campaigns, such as the introduction of packaging of plant origin, investing in green energy, applying for the trademark "guard house" of the Serbian Chamber of Commerce or opening a counseling center and in vitro fertilization center, we could conclude that "Nectar" is one of the socially responsible companies operating in the Republic of Serbia, which supports the confirmation of special hypothesis 4. Secondly, there has been an increase in balance sheet items in regards to short-term receivables, but there has also been a decline in the value of long-term financial investments. Finally, the analysis of capital showed that capital increased in the observed period, to a greater extent in the period 2015-2016, than in the next observed period, but the trend is certainly positive. This may be a consequence of the increase in the value of the item "retained earnings" and positive business in the observed period. Finally, the amounts from the received advances tell us that the customers have confidence in working with the company. On the other hand, the paper analyzes the income statement, whose financial analysis leads us to the following conclusions. Very significantly, the trend of operating revenues shows moderate stagnation in the post-observed period, but we can say that the trend is stable. Analyzing the structure of revenues, we concluded that "Nectar" generated most of its revenues from operating revenues. As a typical company should operate, these percentages are around 90% - in 2015 operating revenues accounted for 93.4%, in 2016 they accounted for 92.3%, in 2017 the share of operating revenues was 89.7% and in 2018, the share of business revenues was 91.99%. Furthermore, while analyzing the income statements, a negative trend of financial revenues was noticed, but also the growth of other revenues. On the expenditure side, the situation is similar, with "Nectar" recording positive results in each of the observed years, with the highest net profit in 2017, when total revenues were the highest. Geographically, sales revenues in the country are about 30% higher than sales revenues abroad, but we should not say that the export of manufactured goods is not a statistically significant item in total revenues. One of the recommendations of this research could be that there is room for improvement of foreign business, which supports the confirmation of the third post-hypothesis. Stable business can be reflected in the increase in the amount of gross wages in the observed period, as well as through the company's

investment in workers' income, provided that there were no major deviations in the increase in the number of workers. This factor analysis could be the beginning of some new, future research. The high difference in the burden of operating income on variable material expenditures in enterprises and competition can be caused by higher physical consumption of materials, fuels, energy and production services by performance in enterprises than in competition, poorer structure of production performance in enterprises than in competition and poorer global parities of sales and purchase prices in companies than in competition, wnich shows that there is an increase in intangible assets. During the analyzed period, the company achieved a positive financial result from regular operations every year, i.e., it achieved a positive financial result from both financing and operating income. The financial result from other revenues was positive only in 2015. Based on everything that has been done, I believe that the primary goal of the paper has been fulfilled, as well as that the hypotheses set in the methodological framework have been confirmed.

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Investment potential of crowdfunding in the development of projects and entrepreneurial ventures

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Abstract: Crowdfunding is a popular form of financing entrepreneurial ventures, especially in America and Western Europe. Crowdfunding is an innovative way of raising money to finance projects and businesses. It is a type of alternative fundraising that involves presenting ideas that need investment, in the most convincing and original way possible, through special platforms. It belongs to the so-called FinTech new market segment, which is a combination of financial services and technology. This specific model of financing in the world is growing rapidly with the development of the Internet and social networks, which has experienced real expansion over the last decade, and now investments in this form of financing reach tens of billions of dollars a year. However, despite the importance and popularity of crowdfunding, this form of funding is not given enough attention in the professional and scientific public. Crowdfunding is an alternative to classic, bank financing. There are several different types of crowdfunding: peer-to-peer lending, equity-based crowdfunding, reward-based crowdfunding, donation based crowdfunding. Each of these types of crowdfunding provides entrepreneurs with certain benefits, i.e. advantages in relation to traditional bank financing. When it comes to the type of crowdfunding with the largest market (peer-to-peer lending), the main advantages over bank financing are: lower interest rates than the ones charged by banks, lower transaction costs, connecting with investors without an active intermediary, shorter administrative and formal procedures, because there is no extensive paperwork and guarantees and guarantors requirements, etc.

Key words: crowdfunding, investments, Investment Crowdfunding, alternative financing, start up, project, entrepreneurship

JEL: O1

Introduction

Many projects and ideas have not had the opportunity to be realized due to lack of interest or sense of their potential and possibilities. Crowdfunding is a type of alternative fundraising that involves presenting ideas that need investment in the most convincing and original way possible - through special platforms. Fundraising through crowdfunding platforms is generally faster than when it is done by traditional methods, by submitting a request to a bank or other financial institutions. In this way, complicated bank lending procedures are avoided, and sometimes it takes very little time to raise the necessary funds. Unlike banks that are reluctant to invest in innovative ideas, crowdfunding platforms motivate investors (or donors) to invest in such ideas. However, the fundraising campaign on the platforms

requires serious preparation, which can take months. Of the thousands of campaigns launched to promote group fundraising platforms, only a certain percentage are successful and receive donor support.

Crowdfunding is a way of entrepreneurial financing thatinvolves the joining of, often small, amounts of capital from a large number of interested investors or donors. Individuals seeking and/or offering funds generally have no historical or personal ties. Crowdfunding [Belleflamme, Lambert & Schwienbacher, 2014] is an innovative way of raising money to finance projects and businesses. Terminologically, the term is derived from the English words "crowd" and "funding". It belongs to the so-called FinTech new market segment, which is a combination of financial services and technology. This specific financing model in the world is growing rapidly with the development of the Internet and social networks, which have experienced a real expansion over the last decade. Investments in this form of financing reach tens of billions of dollars a year. Despite the importance and popularity of crowdfunding, this form of funding has not received enough attention in the professional and scientific public. Only recently, this form of venture financing has attracted the attention of scientists and entrepreneurs [Li & Du, 2020]

Crowdfunding, as a financing model, has several basic advantages. First, crowdfunding significantly reduces transaction costs, as the Internet allows for the collection of small sums from a large number of investors. In this way, large amounts of capital can be raised. Secondly, the Internet allows direct connection of financiers with fundraisers, without an active intermediary. Thirdly, crowdfunding is an effective way to raise funds for beginners in business or idea development, especially because other forms of funding are often unavailable for such ventures. Fourth, administrative and formal procedures are reduced here, because there is no extensive paperwork and the requirement of guarantees and guarantors, as in the case of bank loans. In general, crowdfunding has a positive effect on improving market conditions and the general economic climate by encouraging transparency and stability of the financial market, enabling access to the global financial market, improving the entrepreneurial climate, creating new financial sources by strengthening confidence, reducing dependence on foreign funding and encouraging social activism.

Characteristics and origins of crowdfunding

The first forms of crowdfunding date back to the fourth century AD in China, with the appearance of savings and credit cooperatives (so-called lun-hui) , whose members lent money to each other for various endeavors. Such examples also existed in other parts of the world, and later on, more and more forms of investment appeared, the motive of which was not money earnings. The first form of crowdfunding in Europe was founded by Jonathan Swift, with the launch of the Irish Loan Fund, which allowed funds to be allocated to families who had no collateral but only guarantees from their neighbors. In the 18th century, Alexander Pope, with the help of 750 financiers, published the "Iliad" in English, and in return, the names of all those who participated in this endeavor appeared on the cover of the book. This was a kind of forerunner of award-based crowdfunding, which will be discussed later.

The Statue of Liberty in New York City was funded by 120,000 American citizens in 1885. Then Joseph Pulitzer appealed to the readers of the New York World newspaper to donate money for the completion of the statue [Short, Ketchen, McKenny, Allison & Ireland, 2017].

People who invest money in various ideas can be from anywhere in the world and are called "backers". The first form of crowdfunding that works online appeared in 1997, when an online campaign funded a tour of the British rock band Marillion, raising $ 60,000.

This was the inspiration for the first official crowdfunding platform ArtistShare that still exists today. ArtistShare was launched in 2003 as a platform that connects fans and artists to encourage creative creation and the creation of works of art [Rabasovic, Vicentic & Markovic, 2019].

After the great success of this platform, the possibility of applying the same principle of fundraising to the implementation of different types of projects is realized. In 2005, Kiva was founded, which is a non-profit organization that gives individuals a chance to lend interest-free loans to entrepreneurs in poor areas around the world. In 2008, one of the largest crowdfunding platforms today appeared - IndieGoGo, which enables backers to support the realization of various ideas in order to find innovative solutions for everyday business. Kickstarter is another leading crowdfunding platform that was established a year after IndieGoGo, i.e. in 2009. This platform also operates on the principle of award as IndieGoGo.

Crowdfunding is continuously developing around the world, because the development of technology and the growing number of Internet users enables investors and those who need financing from all parts of the world to connect with each others. Thus, crowdfunding bridges the time and space distances between surplus and deficit markets and economic participants in terms of capital. Today, this method of financing enables the collection of money from a large number of people through Internet sites, and is most often used by newly established trading companies and developing companies as a way to access additional funds or by any other person who has an idea for a project, product or service.

Crowdfunding is a fast-growing phenomenon, and entrepreneurs are directly seeking funds for their own entrepreneurial activities from potentially large audiences of interested individuals. Crowdfunding platforms are websites that interact between those who want to invest their money and those who need funds. The basic characteristics of crowdfunding are shown in the following table.

Table 1. Key characteristics of crowdfunding investors

Criterium	**Crowdfunding (equity)**
Background	Different backgrounds, many have no experience in investing
Access investing	Investing from personal funds
Investment stage	Seed and early stage
Investment instruments	Common stock
Venture agreement	Via web platforms
Due diligence	Carried out by individuals or via the platform
Geographical features of the investment	Most investors are geographically far from the business they want to invest in
Role after investment	It depends on the individual investor, but most remain passive
Return on investment and motivation to invest	The financial side is important, but it is not the only reason to invest

Source: [Wilson, Testoni 2014]

Forms of crowdfunding

Those who raise funds in this way usually pay a fee to the platforms if the financing was successful. Many platforms operate based the "all or nothing" model, which means that the money is obtained if the goal is achieved, and if not - the money is returned, i.e. without financial losses for investors. Depending on the subject of the project being financed, as well as whether the motivation of the investor is rational (material) or emotional, there are several types of this method of financing:

1. Peer-to-peer lending - lending money to a company is done with an agreement that the money will be returned with interest. This method is similar to traditional bank financing, except that borrowing is done from a large number of investors. In this case, the interest rate is lower than those offered by banks, but the earnings are higher than with traditional savings. The market for this type of crowdfunding is larger than the other three combined;
2. Equity-based crowdfunding - the investment is made in exchange for shares in the company, so it is suitable for start-ups. This method is similar to buying shares on the stock market or investing venture capital funds. One of the platforms with this type of financing is Funderbeam;
3. Reward-based crowdfunding - investors make donations for a project or company, and in return, at a later stage, receive a reward (perk) that is not of a financial nature, but in goods or services. Prizes range in value, from symbolic ones such as badges and T-shirts, to valuable prizes such as smart devices. This is the most well-known form of crowdfunding, and the platforms that operate in this type of fundraising - Kickstarter and Indiegogo - have a great contribution to this;
4. Donation-based crowdfunding - individuals (backers) give smaller amounts of money in order to achieve a higher goal of social benefit, i.e. charitable character, without achieving financial or material benefits.

These are the most common forms of crowdfunding, and there is also crowdfunding that is based on profit sharing, bond-based crowdfunding, as well as hybrid crowdfunding models that combine more than one type of this investment.

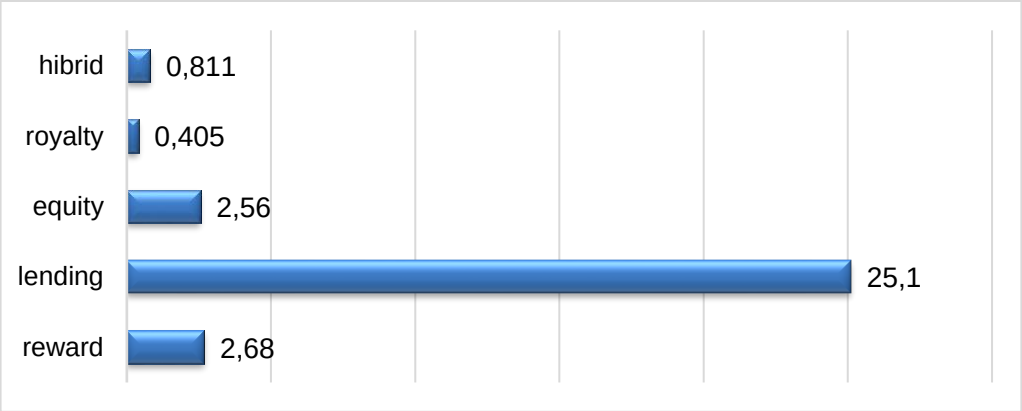
Crowdfunding in the world

In the beginning, crowdfunding was most often used in the field of art, i.e. the creative sector. However, it is increasingly recognized and used as a way of initially financing small businesses and start-ups. Different forms of crowdfunding can be used at different stages of business development. A great chance for the development of crowdfunding was provided by the increasing use of the Internet and technology, but also by the beginning of the crisis in 2008, when banks limited their lending to companies that they considered too risky. Crowdfunding is changing other potential sources of funding at all stages of small business

development. Initial bank financing is being replaced by award-based crowdfunding. Then, instead of the business angels's investments, we have share-based crowdfunding, and instead of institutional investors, we have peer-to-peer lending, which implies financing a project and business by borrowing money at an agreed interest rate, which is favorable both for those who lend and the ones who use the funds.

There are more than 1,300 crowdfunding platforms in the world that facilitate the interaction between entrepreneurs and potential donors for mass financing, and which differ in certain characteristics [Mital, 2020]. It is estimated that in 2015, the total amount of funds raised by the crowdfunding industry in the world amounted to over 34 billion dollars [Wang, Li, Liang, Ye & Ge, 2018; Đekić, 2019, p. 112]. This form of financing ventures and projects is most prevalent in America, where it is estimated that as many as 22% of the population participated in some crowdfunding campaigns [Gregović, Tranfić & Lauš, 2017, pp. 11-12]. The following chart shows the total amount of funding through crowdfunding in the world [Wang, Li, Liang, Ye & Ge, 2018; Đekić, 2019, p. 112].

Chart 1. The total estimated amount of funding for various forms of crowdfunding for 2015 is billions of dollars



Source: [CrowdExpert.com 2017]

As underlined Crowdfunding is most prevalent in North America, but is also developing rapidly in other regions of the world. In 2015, the distribution by regions was as follows: North America $ 17.2 B, Asia $ 10.54 B, Europe $ 6.48 B, Oceania $ 68.6 M, South America $ 85.74 M, Africa $ 24.16 M.

The World Bank predicts that the crowdfunding market reached a value of about $96 billion by 2020 [Šebek, Klašnja, Harbers, Krneta & Stojanović, 2019]. World Bank studies show

that, according to income, the number of households that can participate in this type of investment ranges from 240 to 344 million. Given these and other assumptions about the speed of crowdfunding development and the existence of incentive regulations and other factors, the total market potential of this form of financing by 2025 is estimated at $90-96 billion per year [World Bank, 2013, pp. 33-43].

Some of the most well-known global crowdfunding platforms are Kickstarter (the most famous reward-based crowdfunding platform), Indiegogo (the oldest and largest reward-based crowdfunding platform), Globalgiving (the most famous global donation-based crowdfunding platform). The importance and number of platforms have increased in recent years, as a growing number of people are using the Internet in order to place and raise funds. The Internet gathers a huge number of people, and sites like the ones mentioned above mobilize huge funds from a large number of people around the world. Thus, for example, through Kickstarter, a platform that was established in April 2009, as many as 196,045 projects have been successfully realized, collected from almost 19.2 million backers. The total funds raised so far amount to almost five billion and 570 million dollars [Kickstarter, 2021]. However, the legality of sites such as Kiva, MicroPlace, Indiegogo, or Kickstarter was questioned and it was thought that they should be registered as broker-dealer, in order to facilitate the sale of shares so as to to reduce fraudulent offers. In early April 2012, the law was signed - The Jumpstart Our Business Startups (JOBS) Act, which sets this method of financing as an exception to the regulations of the Securities and Exchange Commission (SEC) for companies that collect less than two million dollars, but restrictions on individual investments are also set [Board of Governors of the Federal Reserve System, 2012, p. 40]. The law allowed companies to seek funding from the public, but investment was only allowed to accredited investors. However, the goal of this type of financing is that every citizen can freely invest in companies that seek funds through the platform.

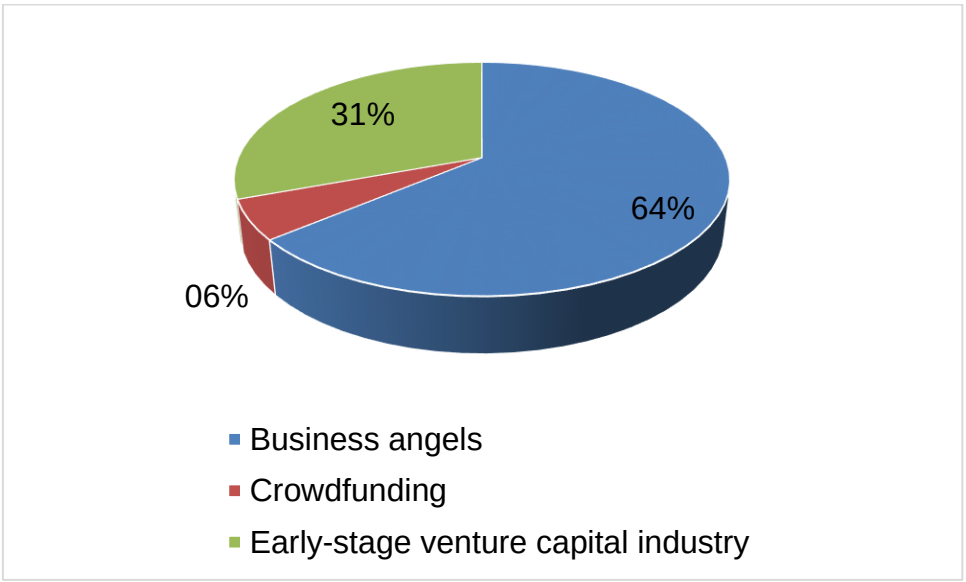
Status and perspectives of crowdfunding in the European Union

Some of the most important non-banking sources of financing for small and medium enterprises in developed countries (increasingly also in countries in transition) are financial leasing, forfeiting and factoring, microcrediting, crowdfunding, venture capital funds and business angels. The financing of a company mostly depends on the life cycle phase of the

company. Start-ups will seek finance in the capital market, from angel investors, crowdfunding investors or venture capital investors.

Crowdfunding, venture capital funds and business angels are characterized by different goals, motivation, amounts of funds that can be raised, but are to some extent complementary in financing companies in the early stages of development. It is important to say that these are the three most common forms of business investment in the early stages of development in Europe. According to EBAN data, the total volume of investments of these three forms of corporate financing reached 8.6 billion euros in 2015. The largest part of investments in the early stages of the company are investments of business angels in the amount of 6.1 billion euros, followed by investments from the venture capital industry in the early stages of the company in the amount of 2.1 billion, while crowdfunding, as a new form of investment, reached 4 billion in the European market, which has been growing rapidly and this trend is expected to continue [European Business Angel Network, 2016, pp. 1-2]. Two years later, in 2017, investments in these forms of financing reached 11.4 billion euros, of which business angel investments amounted to 7.3 billion, venture capital industry investments 3.5 billion, and crowdfunding investments amounted to 1.75 billion euros. The percentage share of each of these investments in the total European investment market of the early stages of enterprise development, according to EBAN data, is shown in the following chart.

Chart 2. The three most common forms of company investment in the early stages of development in 2017



Source: [European Business Angel Network, 2018, p. 5]

When looking at the general crowdfunding market in Europe, there were 597 platforms operating during 2017, through which the turnover amounted to 10.4 billion dollars. In 2018, the number of platforms increased to as many as 794 platforms with a turnover of 18 billion dollars. Most of the platforms are concentrated in large European economies: 89 in Great Britain, 63 in Germany, 51 in France, 51 in Italy, 45 in the Netherlands and 39 in Spain. On the other hand, in the countries of Southern and Eastern Europe, there were less than 10 platforms, most of which were based in foreign countries [Wenzlaff, Odorovic, Ziegler & Shneor, 2020].

Crowdfunding is developing rapidly, and it should be borne in mind that crowdfunding in the West was at the very beginning of development only fifteen years ago. In the direction of creating a good basis for the development of crowdfunding, it is necessary, first of all, to provide a legal basis, i.e. to create an incentive legislative framework that would reduce tax and financial barriers. Also, it is necessary to work on introducing the public to this concept, and even to work on educating citizens within the formal education system. In addition to legal restrictions and lack of knowledge of how this form of project financing works, a major problem is the lack of public confidence in financing "via the Internet", but also insufficient commitment to developing a critical group of experts to improve this concept and spread awareness among potential investors. Efforts have recently been made to bring crowdfunding closer to the public, but this requires greater support from the system. The existence of regulatory frameworks in the field of market financing is extremely important for the development of modern economies based on entrepreneurial spirit. According to [Demirguc-Kunt & Maksimovic, 1995, p. 8], companies that are granted access to capital grow and develop more expansively than those that are practically prevented from doing so.

With the recent outbreak of COVID-19, the crowdfunding market has grown significantly, especially donor crowdfunding intended to support and assist communities, individuals and many organizations in the fight against this pandemic. For example, in April 2020, Facebook launched the Facebook Fundraiser, a platform where people can raise funds for charity to help others during the pandemic [Mordor Intelligence, 2020]. Also, new regulatory changes and strategies adopted by the European Parliament regarding crowdfunding should contribute to the growth of these investments in Europe and its better understanding.

Summary, recommendations

Crowdfunding is an alternative way of raising money to finance projects and it involves presenting ideas that need investment through special platforms. The main advantages of crowdfunding in comparison to bank financing are: lower interest rates than those charged by banks, lower transaction costs, connecting with investors without an active intermediary, shorter administrative and formal procedures, because there is no extensive paperwork and guarantees and guarantors requirements, etc.

Some of the obstacles in the current weak development of crowdfunding as a financing model: low level of awareness of the target public about the existence and mechanisms of the functioning of this method of financing, lack of knowledge about its potential benefits, a lack of response from backers from certain markets, and many others. The conclusion is that there is a lot more room for development, but also that it is necessary to educate all parties and provide better information about the opportunities and motivation for participants from both sides.

Once the biggest regulatory barriers have been addressed, the platforms should focus on improving public education and understanding crowdfunding so as to support its acceptance in different markets.

By having regulatory changes and a strategic approach to understanding this way of investing and financing projects, the community will support the implementation of projects and avoid the difficult and complicated procedures of the traditional way of raising money. Many start-ups can obtain the necessary funding in this way, because the decision on whether an investment application will be approved by various financial institutions does not depend on the few experts in charge of these types of jobs, as in the case of traditional financing. In fact, in crowdfunding, the fate of new ideas is decided by a large number of people around the world, who are also potential loyal buyers and consumers of products or services.

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Joint ventures in family and non-family firms

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Abstract: This paper aims to investigate how the nature of a company's ownership and board characteristics influence the investment choices in joint ventures from the dimensional point of view. In doing so, it analyzes an international sample of companies belonging to the major economies of continental Europe, controlling for the effect of the other intellectual capital components and for the fixed effects of industry, company and year. The results indicate that the type of joint venture, link vs scale, has a significant effect and, in particular, the choice of a link joint venture significantly reduces the size of the investment for family companies, whilst human capital efficiency increases JVs investment size for all firms. On the other hand, in relation to the nature of ownership, the presence of CEO duality has an opposite effect on the size of the investment in joint ventures, as it has a lowering effect in family businesses, while it exerts an amplifier influence in non-family businesses.

Keywords: joint venture, family firms, link, scale, board characteristics

JEL: G24

Introduction

Family companies are a leading organizational form in economies across the world. According to the Family Firms' Institute, two-thirds of all companies around the world are family-managed and more than 70% of global GDP annually is produced by family businesses that provide 50%-80% of the world's employment[20].

Engaging in new ventures is a priority for family companies trying to survive, achieve profitability and growth; a connection with other companies would allow them to gain the knowledge necessary to stimulate entrepreneurship and avoid the effect of conservatism that can threaten family firms' financial sustainability (Zahra, 2010). The relevance of family businesses' relational capital in leveraging the firm's absorptive capacity to transform and use external knowledge has been highlighted in the literature (Andersén, 2015). Moreover, there

[20] http://www.ffi.org/?page=GlobalDataPoints. Last accessed 18th April 2018

is evidence that alliances and partnerships, such as joint ventures, play a relevant role in forming company legitimacy and their sustainable technologies (Kishna *et al.*, 2017).

JV literature has addressed several topics such as JV performance, innovation and internationalization. A stream of this literature has taken into account the effect of the characteristic of a firm's ownership and management on JV investment choices, mostly focusing on the internationalization perspective and entry mode choices (Sestu and Majocchi, 2020; Debellis *et al.*, 2020; Scholes *et al.*, 2016; Kuo *et al.*, 2012; Claver *et al.*, 2007), and innovation (Feranita *et al.*, 2017). Literature has pointed out the influence of the unique bundle of resources generated by the interaction of family and business (Habbershon and Williams, 1999) on a firm's intellectual capital (Cabrera-Suárez *et al.*, 2001). As a matter of fact, family firms rely on specific human capital intangibles provided by the family's involvement in the firm and related to the founder's personality, the values shared by family members or the knowledge acquired from previous generations (Claver-Cortés *et al.*, 2015). The family's moderating role on the relationship between IC and innovation (Diéguez-Soto *et al.*, 2016), its effect on relational capability development (McGrath and O'Toole, 2018), as well as family firms' unique characteristics in creating and governing joint ventures (Debellis *et al.*, 2020), have been highlighted by the literature.

Joint ventures (JV) are the expression of a peculiar component of a company's intellectual capital (IC), i.e. its relational capital that represents the part of knowledge embedded in relationships with external stakeholders (Sharabati *et al.*, 2010; Zambon, 2002). According to the type of alliance - link or scale - partners contribute different, or similar, capabilities producing different outcomes.

Recent research has also highlighted the importance of pointing out the possible interactions and synergies between the different components of IC (Crupi *et al.*, 2020): they influence each other and certain components of IC can benefit from the improvement of other components (Johnson, 1999; Reed *et al.,* 2006).

To the best of our knowledge, the literature has not yet investigated how family involvement in the firm affects its investment size in JVs by taking into account the effect of the type of the JV as well as of other components of a firm's IC. Therefore, it is of interest to analyze how a firm's ownership and management nature (family or non-family) affects the investment in joint ventures, controlling for the effect of the type of JV and of other IC components.

This paper addresses the following research question*: Does family control and influence affect investment size in JVs? If so, does JV type and the interplay of other IC components moderate this effect?*

We address this research question by basing it on the socioemotional wealth (SEW) concept. This refers to the stock of affect-related value that a family derives from its controlling position in a firm (Gomez-Mejia *et al.*, 2007; Berrone *et al.*, 2012). It shapes firms' decisions (Gomez-Mejia *et al.*, 2011) and may affect the investment in JVs in different ways.

We analyze a sample of Italian, Spanish, German and French non-financial listed firms over the period 2010-2018. The sample is of particular interest as these economies are widely characterized by the presence of family businesses that have long-lasting family control (Franks *et al.*, 2012).

Our results point to the fact that family control and influence negatively affect JV investment size; the type of joint venture has a significant effect only for family businesses, whilst human capital efficiency is significant only at the level of all firms.

This study contributes to the existing research on joint ventures and it adds to intellectual capital literature by also investigating the efficiency by which IC components affect the size of investments in joint ventures.

Our research contributes to family firm literature, in particular to the stream of research on the determinants of family firm investments.

The paper is organized as follows: chapter 2 provides the theoretical framework, the literature review and the consequent hypotheses; chapter 3 describes the data and methodology; chapter 4 presents and discusses the results and chapter 5 concludes by pointing out the limitations and implications of the study as well as including suggestions for future research.

Theoretical framework, literature review and hypotheses

Socioemotional Wealth and its dimensions

We address our research question through the lens of the socioemotional wealth (SEW) concept. This refers to the stock of affect-related value that a family derives from its controlling position in a firm (Gomez-Mejia *et al.*, 2007; Gomez-Mejia *et al.*, 2011; Berrone

et al., 2012). Different non-financial aspects of the business that satisfy the affective needs of the controlling family members converge in the concept of socioemotional wealth. Five different dimensions have been categorized as the main non-financial utilities: family control and influence on the business, identification of family members with the firm, binding social ties, emotional attachment of family members and the renewal of family bonds to the firm through dynastic succession (Berrone *et al.*, 2012). These dimensions may exert different and contrasting effects on a firm's propension to invest in joint-controlled ventures.

Owning family members derive a strong emotional return from family influence and control over the business, as they are deeply attached to it (Gomez-Mejia *et al.*, 2007). The level of proprietary control over the company is itself a source of a strong emotional return for the family and provides it with power and legitimacy in supporting decisions aimed at increasing the non-financial returns it derives from the company (Zellweger *et al.*, 2012). The firm is perceived by the owning family as an extension of the family itself because of the tight links and strong sense of identification with the firm (Berrone *et al.*, 2012). As a matter of fact, there is evidence that the desire to maintain company control firmly in the hands of the family implies that family businesses tend to be more levered than non-family firms (Gottardo and Moisello, 2018; Bacci *et al.*, 2018) and, consistently, the desire to preserve the sense of identification leads family businesses to avoid opening up their equity to non-family investors (Romano *et al.*, 2001). Therefore, the relevance of control and sense of identification for family firms might negatively affect their desire to participate in joint control ventures in which they would have to share control of the business with non-family members.

Family companies are particularly prone to developing social bonds, which provide family members with a strong sense of legacy and relevant emotional returns (Berrone *et al.*, 2012; Gomez-Mejia *et al.*, 2011; Astrachan and Jaskiewicz, 2008). Family firms develop strong ties with employees, who become part of a sort of extended family, as well as with suppliers, with the community in which the company operates and with its stakeholders at large (Berrone *et al.*, 2010). Owing to the ability to create social bonds, strictly related to the pursuit of non-financial objectives, family companies enjoy a higher reputation than non-family firms (Beck and Prügl, 2018; Gavana *et al.*, 2018; Binz *et al.*, 2013). The relational ability and reputation may help the selection process of the co-venturers and facilitate family firms' joint venture investments.

The SEW dimension related to the *emotional* attachment of family members highlights the role of emotions in family business management owing to the mix of shared experiences and events that affect current activities and relationships within a family company (Berrone *et al.*, 2012). Emotions can lead to the choosing of family members with limited skills and experience to act as managers and, therefore, if the company wants to explore new markets, the JV may limit the risks. So, the facilitation of the internationalization processes might be a stimulus for investment in JVs.

Families perceive the firm they own as a long-term investment to be passed on to their heirs in order to renew the family bonds to the business and to meet an emotional need to perpetuate the family dynasty (Berrone *et al.*, 2010 and 2012). For this reason, they receive emotional returns in the present as well as future benefits of control (Zellweger *et al.*, 2012). The preservation of socioemotional wealth affects family companies' risk-taking decision-making in different ways and this is why family businesses are risk-averse and risk-willing at the same time (Gomez-Mejia *et al.*, 2007). There is evidence that family firms are prone to facing the risk of financial performance (Gomez-Mejia *et al.*, 2007) and the risks related to debt financing in order to preserve family control over the business (Gottardo and Moisello, 2018). On the other hand, they avoid entrepreneurial risk and high outcome variance ventures in order to protect the business' survival and this evidence is stronger when the family exerts its influence directly through having a family CEO (Huybrechts *et al.*, 2013). Consequently, the desire to renew the family bonds to the firm through dynastic succession produces a long-term time horizon and risk aversion that may affect investments in joint ventures.

Ownership, board characteristics and Joint Ventures

The nature of a firm, notably family business or non-family business, influences the propension to engage in joint ventures, when the company chooses to internationalize, or when it achieves innovation goals.

Family firms are characterized by an ability to develop a relevant organizational social capital; this results from the firm's interaction and relationships with a wide variety of external stakeholders (Zhara, 2010).

Regarding internationalization processes, family firms face a paradox as they are less prone to form international joint ventures (IJVs), but they show a greater ability to govern

them (Debellis *et al.*, 2020). In family businesses, the strong emotional attachment of family members to the firm causes a lack of strategic sensitivity. Family firms tend to undervalue the opportunity to acquire new knowledge through strategic alliances and remain focused on the existing knowledge that has determined their success thus far. Moreover, participating in an IJV implies sharing part of the firm's knowledge, with the risk of misappropriation if the partners behave in an opportunistic way that leads to a loss of SEW. The presence of external members on the board is a solution to overcome this lack of strategic sensitivity. When outside directors are highly skilled and their values are sufficiently aligned with those of family members, they may help the family to understand that engaging in an IJV is not in contrast with the preservation of SEW as it may be an opportunity to survive and pass the firm on to future generations.

Research has demonstrated that the means of entering foreign markets is affected by the ownership characteristics of the local firm (Sestu and Majocchi, 2020). In fact, family firms have a specific asset which is not tradable on the market: "familiness". When the investing firm is a family firm and the local firm is a non-family one, a wholly owned subsidiary (WOS), i.e. a full acquisition of the local firm, is more likely. In this case, a WOS allows the investing firm to maintain the family's control and transfer its family-specific assets abroad, combining them with the assets of the local firm. On the other hand, when the investing firm and the local firm are both family firms, both their family-specific assets cannot be separated from the firm. In this case, a joint venture is more likely as this entry mode allows both parties to maintain their respective family status and the profits of the joint venture will remunerate the co-venturers for the assets transferred.

Furthermore, the governance quality of the host country plays a role in a firm's entry mode decisions. Chang *et al.* (2014) provide evidence that firms tend to prefer wholly-owned subsidiaries rather than joint ventures when the governance quality of the host country is high. Such a context diminishes the need to rely on local partners and, in turn, allows them to maintain control over the business. This fact is particularly important to family firms where this tendency is strengthened as the degree of family control increases. The need to rely on the support of a local partner is particularly relevant for firms with little experience on international markets. Thus, inexperienced firms tend to prefer joint ventures rather than wholly-owned subsidiaries when they internationalize. In family firms, managers are often hired not for their capabilities but because they are members of the family. Therefore,

inexperienced family firms, compared to inexperienced non-family firms, are more likely to choose joint ventures than WOS. On the contrary, experienced family firms are more likely than experienced non-family firms to choose WOS, given the stronger desire to maintain control over the foreign business and preserve their SEW (Kuo *et al.*, 2012).

Prior studies have highlighted the heterogeneity of family firms, demonstrating how different types of family ownership structure differently influence foreign market entry mode decisions. This is due to the greater, or lesser, importance placed on two main SEW priorities: the long-term survival of the firm and the maintenance of family control (Pongelli *et al.*, 2016). When the level of founder ownership is high, non-cooperative entry modes are preferred due to the founder being reluctant to share control and business decisions with external parties. On the contrary, findings reveal a positive association between cooperative entry modes (joint ventures or contractual agreements) and the level of multiple family members' ownership. In multiple family ownership cases, that is when the ownership structure includes families other than the nuclear family, family firms are more prone to engage in joint ventures rather than rely on wholly owned subsidiaries when they choose equity entry modes.

Based on the theoretical framework and the literary review, we posit the following hypotheses:

H1a. Family ownership control negatively affects JV investment size

H1b. Family involvement on the board amplifies the effect of family control on JV investment

Link and scale JVs

Finally, family firms may present a different propensity to engage in scale joint ventures rather than in link joint ventures. A scale joint venture is created to achieve economies of scale. The co-venturers enter together a contiguous stage of their production or distribution cycle or a new market, bringing similar skills and resources to the joint project. In a link joint venture, the co-venturers pursue different objectives and contribute distinctive and complementary skills and resources to the joint project (Hennart, 1988). Since co-venturers are also competitors, a link joint venture gives them the opportunity to acquire partner capabilities and use them for private benefit. Therefore, asymmetric outcomes are more likely to occur in link joint ventures than in scale joint ventures (Dussage *et al.*, 2004). Confirming this risk, the takeover of the joint venture by a partner occurs earlier and more

often for link joint ventures than for scale joint ventures (Dussage *et al.*, 2000). As a consequence, given family firms' risk aversion and the differences between link and scale joint ventures and the implications in terms of risk, family businesses might be less prone to invest in link joint ventures than their non-family counterparts. H2 is formulated as follows:
H2. The type of JV investment moderates the effect of family control on JV investment

Intellectual capital in family firms

Literature has considered how the nature of the ultimate controlling owner can influence the quality and the development of IC. In this vein, research has highlighted that family firms can rely on peculiar intangible assets that are not accessible to their non-family counterparts. Trevinyo-Rodríguez and Bontis (2007) have analysed merger and acquisition (M&A) deals involving family firms in Mexico and have coined the term *intellectual capital in family businesses* (ICFB), defined as the set of quantitative and qualitative intangible assets that influence a company's performance. In particular, qualitative intangible assets comprise: the soul of the firm, namely the founder and/or family's vision, values, energy, social networks, cohesiveness and commitment transmitted to the employees; the brain of the firm, that is the processes, procedures and policies of the organisation and, finally, the heart of the firm, which consists of the network of the firms that allows the relationship between the different parts of the firm to be maintained and developed. Being aware of IC-related intangibles owned by family firms may help managers to focus and effectively manage the resources that can create and maintain the competitive advantage of family firms relative to their non-family counterparts (Sirmon and Hitt, 2003). The identification of intangibles inherent to family firms has been addressed by Claver-Cortés *et al.* (2013). The mentioned study is based on the literature on family firms and on the notion of IC in building an intellectual capital model which lists the main IC elements specific to family firms, grouped into the three IC categories: human capital, structural capital and relational capital. Using a case-study approach, the authors also provide some examples of the intangibles included in their model. The literature highlights that human capital represents the most important intangible of family firms (Sirmon and Hitt, 2003). Family firms are characterized by long-term relationships with employees that foster its organizational social capital (Leana and Van Buren,

1999). Claver-Cortés *et. al.* (2015) identify ten human capital intangibles that characterize family firms and find sixty indicators useful to managers in order to measure such intangibles.

Given the peculiarities of family firms, research has also analyzed how the degree of 'familiness' affects IC efficiency. 'Familiness' is defined as the unique bundle of resources created by the interaction of family and business (Habbershon and Williams, 1999). By using family ownership and the proportion of family directors on the board to approximate the degree of familiness, Greco *et al.* (2014) find that, compared to their non-family counterparts, family firms are characterized by higher average VAIC^{TM}.

With reference to an Italian sample, Bresciani *et al.* (2013) investigate how human, relational and marketing capital affect the innovation capacity of family firms relative to their non-family counterparts. The findings suggest a high innovation capacity of family firms because this type of company, compared to non-family businesses, shows higher average values for qualified employees and employees engaged in R&D activity. They also outperform non-family businesses regarding cooperation agreements.

Based on the above discussion we posit the following hypothesis:

H3. Human capital efficiency moderates the effect of family control on JV investment

Data and methodology

Data

The study uses data from Italian, Spanish, German and French stock markets for the years 2010-2018 to investigate how family involvement in the firm affects its investment size in joint ventures as well as how other components of a firm's intellectual capital (IC) are related to investments in joint ventures (JVs). Italy, Spain, Germany and France are civil-law countries with similar legal settings, financial markets level of development, they are characterized by the prevalence of closely held companies (La Porta *et al.*, 1999) and by the presence of family businesses that have long-lasting family control (Franks *et al.*, 2012). From the accounting point of view, the listed companies adopt the same set of standards for the preparation of their financial statements.

A search was made on the whole population of listed firms to identify those with interests in joint ventures in each year from 2010 to 2018, as reported in the consolidated financial statements. The final sample is composed of all non-financial firms with JVs detected

in the population of these countries' listed firms. Once companies with missing financial data and missing information on JV type were removed, we have, on average, 132 firms for each year, and we have 855 firm-year observations. We hand-collected the data on joint venture assets from the notes to the co-venturers' consolidated financial statements. All financial statement information and market data for the co-venturers was collected from Orbis, the global Bureau van Dijk database.

Methods

In order to achieve this objective, we estimated the following regression model:

$$Size\ JV_{it} = \alpha_0 + \beta_1 \text{Ceo-D} + \beta_2 \text{W-Board} + \beta_3 \text{F-Ceo} + \beta_4 \text{F-Board} + \beta_5 \text{HCE} + \beta_6 \text{SCE} + \beta_7 \text{CEE} + \beta_8 \text{Link JV} + \beta_9 \text{Size} + \beta_{10} \text{Roa} + \beta_{11} \text{Extra} - \text{EU Op} + \sum_{j=1}^{J} \gamma_j I_{j,it} + \sum_{t=1}^{T} \delta_t D_t \quad (1)$$

The dependent variable is the size of investment in JV in log terms, measured as the sum of the assets of a firm's JVs (based on the firm's share). The explanatory and control variables are CEO-D, W-Board, F-CEO, F-Board, HCE , SCE , CEE , Link JV, size, Roa, Extra-EU Op, year and industry dummies (Table I).

CEO duality is a dummy variable that takes the value of 1 if the CEO is also the chairperson of the board of directors. Woman on Board is the weight (per cent) of women that sit on the board of directors.

Family, CEO is a dummy that takes the value of 1 if the CEO is a member of a family that owns at least 20% of the firm's common shares. Family on board is the weight (per cent) of family members who sit on the board. Ownership data was reconstructed based on the information available on the Orbis database. We defined a family firm as one where a family owns at least 20% of common shares (Villalonga and Amit, 2010).

HCE is a proxy for the efficiency of human capital. It is calculated as VA/HC i.e. value added scaled by total salary and wage duties for the company. Value added is given by VA= OUT-IN OUT=total sales where IN=cost of bought in materials, components and services.

Structural capital SC is measured as SC=VA-HC, and structural capital efficiency SCE is given by SCE=SC/VA. ICE is then given by ICE=HCE+SCE.

Pulic (2004) proposes that the efficiency of capital employed be taken into account as IC cannot create value added on its own: CEE=VA/CE where CE is the book value of net

assets, so that VAIC=ICE+CEE is a measure of a firm's overall efficiency. VAIC components are calculated using data retrieved from firms' financial statements, which are publicly available and include quantitative data. Since data are obtained from audited financial statements rather than being subjective evaluations, such as questionnaires, VAIC methodology provides a standardized and consistent measure (Shiu, 2006). Iazzolino and Laise (2013) argue that the VAIC approach does not contravene any fundamental accounting principles. In Pulic's work human capital is defined not as the actual skills, capabilities, etc., of the employees but the amount of investment in employees as a return of the set of employee characteristics and SC is defined not as a set of intangible assets but as the part of VA created by a set of intangible asset characteristics. So, once the concepts are properly comprehended, the VAIC approach "has its own logical coherence" (Iazzolino and Laise, 2013: p. 552).

In order to classify a JV as 'link', we followed Laurenco and Curto's methodology. We identified the JVs for each venturer from the notes in the consolidated financial statements. We then collected information about each JV's business, as well as the venturers' business, in order to analyze and draw conclusions about the role of each venturer in the JV. We looked for information about JV's business and venturers' business on the JV's website as well as in the venturers' websites. When the venturers undertake complementary businesses in different industries, we classified the JV as a link venture, and when the venturers operate in a similar business, the JV was classified as a scale venture. As a co-venturer may participate in more than one JV, in line with Laurenço and Curto (2010), we coded the co-venturer as 'link' when the majority (in number) of joint ventures are link. Link JV is a dummy that takes the value of 1 when the majority (in number) of joint ventures of a firm are link, otherwise the dummy takes the value of 0.

Firm size is measured as the logarithm of assets. Firms' profitability is proxied by Roa, the ratio of operating income to total assets. Extra-EU Op is a dummy variable that takes the value of 1 when a firm operates in extra European Union countries, otherwise it takes the value of 0.

We estimated model (1) using a GLS panel-data approach with standard errors adjusted for correlation within a cluster, assuming that standard errors are clustered by firm. A panel-data approach uses efficiently the cross-section and time-series data, increasing the parameter's reliability and also reducing the likelihood of multicollinearity problems. To control for industry and year fixed-effects, we included dummy variables in the

model. $I_{j,i,t}$ is a dummy variable that takes the value of 1 if the co-venturer *i* is from industry *j* and 0 otherwise, to control for differences across industries; D_t is a dummy variable that takes the value of 1 in year *t* and 0 otherwise, to allow for differences in the intercept term over time.

Descriptive statistics

We report in Table 2 the breakdown of our data for family and non-family firms for the period 2010-2018, showing the mean and standard deviations of the dependent and independent variables. We also present the t-statistics and their p-values to verify the differences between family and non-family firms. There were 540 firm-year observations for non-family firms and 315 firm-year observations for family firms. The t-statistics indicate that joint venture size, human capital efficiency and CEO duality are significantly different at the 1% significance level between the two samples while there is evidence of differences at the 5% level for the proportion of link-type joint ventures.

Table 1. Descriptive statistics.

	All Firms	Family	Non-Family	T-test
JV Size	11.06 (3.26)	10.62 (3.28)	11.33 (3.23)	3.46 ***
CEO-D	48.06%	54.79%	43.83%	-3.49***
W-Board (%)	27.11 (13.40)	28.7 (11.8)	26.1 (3.07)	-2.95***
F-CEO	38.51%	58.48%		
F-BOARD(%)	7.29 (11.73)	17.91(12.32)		
CEE	1.01 (3.49)	0.89 (0.97)	1.08 (4.33)	0.81
HCE	3.36 (8.36)	4.32 (13.00)	2.79 (3.37)	-2.66***
SCE	0.44 (0.42)	0.42 (0.54)	0.46 (0.34)	1.36
Link JV	39.93%	40.97%	34.47%	-2.10**
Size	14.98 (2.14)	14.93 (2.03)	15.02 (2.21)	0.77
ROA	3.73% (9.81%)	3.78% (8.84%)	3.69% (10.40%)	-0.14
EXTRA UE OP	29.23%	28.50%	29.79%	0.41

Source: own elaboration

Table 2 gives the correlation coefficients for the variables used in the regression models for the full sample.

Table 2. Correlations

	JV Size	Size	ROA	CEO D	W-Board	F CEO	FBoard	CEE	HCE	SCE	Link JV
Size	0.33***										
ROA	0.06**	0.17***									
CEO-D	0.02	0.01	-0.09***								
W-Board	0.22***	0.20***	0.02	0.01							
F-CEO	-0.21***	-0.05	-0.06*	0.13***	-0.09***						
F-BOARD	-0.14***	0.03	0.08***	0.19***	-0.09***	0.37***					
CEE	-0.02	0.01	0.04	0.06*	-0.04	0.00	0.06*				
HCE	0.04	0.04	0.08**	-0.13***	-0.08**	-0.09***	0.03	-0.05			
SCE	0.05	0.20***	0.30***	-0.12***	-0.05	-0.13***	0.06*	-0.05	0.27***		
Link JV	-0.06**	0.06**	0.04	0.06*	0.01	0.08**	0.11***	-0.03	-0.07**	0.05	
EXTRA UE OP	0.13***	0.19***	0.08***	0.26***	0.19***	0.05*	0.14***	0.05	-0.05	-0.01	0.06*

Source: own elaboration

Results and discussion

As we have a panel longitudinal dataset, we estimated Equation (1) by calculating clustered standard errors to account for the firm-fixed effects (Table 3). This procedure gives unbiased standard errors as long as the fixed effects, (time and industry) are negligible. We also lagged the CEE, HCE, SCE and ROA independent variables in order to avoid problems of reverse causality.

Table 3. GLS panel regression results with lagged variables.

	All Firms-1	Non-Family-1	Family-1	Family-2
Intercept	5.34 (2.74)***	3.44 (1.85)*	5.76 (2.07)**	5.77 (2.06)**
CEO-D	0.27 (0.60)	1.50 (3.01)***	-2.40 (-3.14)***	-2.13 (-2.20)**
W-Board	0.22 (2.73)***	0.17 (2.10)**	0.16 (0.92)	0.19 (1.04)
F-CEO	-			-0.51 (-0.56)
F-BOARD	-			0.49 (0.17)
CEEt-1	-0.02 (-1.33)	-0.03 (-2.28)**	0.06 (1.02)	0.06 (1.07)
HCEt-1	0.04 (4.93)***	0.04 (0.47)	-0.00 (-0.09)	-0.00 (-0.15)
SCEt-1	-0.23 (-0.70)	-0.03 (-0.05)	-0.41 (-1.30)	-0.38 (-1.13)
Link JV	-0.79 (-1.72)*	-0.46 (-0.82)	-3.31 (-2.77)***	-3.18 (-2.94)***
Firm Size	0.41 (3.47)***	0.47 (3.83)***	0.50 (2.49)**	0.49 (2.40)**
ROA t-1	-1.34 (-0.39)	2.52 (0.57)	0.30 (0.07)	-0.48 (-0.11)
EXTRA UE OP	0.56 (1.21)	0.44 (0.80)	2.08 (1.86)*	1.98 (1.92)*
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
obs	758	479	279	279
R^2	0.30	0.45	0.42	0.42

*All variables were defined in Table I.*** Indicate significance at the 1% level; ** Indicate significance at the 5% level; * Indicate significance at the 10% level.*

Our results show that the overall size of investment in JVs for family businesses is smaller than for non-family businesses. This is in accordance with H1a and the view that family firms attribute a fundamental value to family control in order to preserve socioemotional wealth, that is the system of non-financial returns that the family derives from the business (Berrone *et al.,* 2012; Gomez-Mejia *et al.*, 2011). This result is also consistent with studies reporting that family firms are not prone to expanding through cooperative entry modes (Gomez-Mejia *et al*., 2007; Gomez-Mejia *et al*., 2011), and supports the statement of Debellis *et al*. (2020). This was presented in their theoretical contribution to family firms' international JVs: they argue that family firms, in spite of their higher ability to establish and govern JVs, have a lower willingness to form them.

Consistent with H1b, our results point out that CEO duality increases JV investment size in non-family firms whilst it has the opposite effect in family businesses. According to La Porta *et al.* (1999), in family businesses, family members exert dominant control over the board and may serve as CEO and/or chairperson. As a result, CEO duality is more common in family-controlled firms than non-family firms (Cheung *et al.*, 2005; Chen *et al.*, 2005; Lam and Lee, 2008) and it is the expression of the strong will of the family to maintain business control and to preserve SEW. For this reason, the presence of CEO duality in family firms fosters a long-term investment horizon and risk aversion that, as noted above, tends to lower JV investment size.

Conversely, the percentage of family members on the board does not affect JV investment size. This is probably due to the fact that this percentage might have the opposite effect in different generational stages: in earlier generational stages, family members on the board belong to the same nuclear family, the influence of the founder is stronger, as is the long-term perspective, so a strong family presence on the board leads to a preference for investments that are under the family's complete control. In later generational stages, family members on the board might belong to different family branches and they may prefer to pursue financial objectives compared to SEW and have a different risk propension that might increase investment size in JVs (Le Breton-Miller and Miller, 2013). This interpretation is consistent with the evidence that firms are less prone to engage in international JVs when ownership is concentrated in the hands of the founder and more prone when ownership is held by several members not belonging to the same nuclear family (Pongelli *et al.*, 2016). The former ownership structure characterizes the first generational stage and the later ones.

Our results highlight that, in non-family companies, the presence of women on the board positively affects JV investment size. This evidence is consistent with research on gender diversity reporting that women's representation on the board positively affects a firm's commitment towards its stakeholders (Nadeem *et al.*, 2017) as well as its reputation (Bear *et al.*, 2010) and that this might facilitate the development of its relational capital and the creation of JVs. The relation between gender diversity and JV investment size is not significant for family firms, and this evidence could be the result of mixed effects. As a matter of fact, female directors may be family or non-family affiliated and, in the majority of gender-diverse boards, at least one woman belonged to the first type (Bianco *et al.*, 2015). Family and non-family women on the board may have a different effect on a firm's JVs investment size as the former are strongly led by SEW preservation and the latter by financial goals. Empirical evidence on the effect of family and non-family female directors on family businesses' CSR engagement supports this interpretation (Campopiano *et al.*, 2019)

Our results point out that family firms are more likely to implement link-type JVs than non-family companies. This is probably due to the fact that link JVs are an alternative means of entering foreign markets to a wholly owned subsidiary. This result is in line with recent research pointing out that family firms, compared to non-family businesses, are more likely to choose JVs rather than WOSs when entering a new market, due to their risk aversion, as they would reduce the risks linked to the inexperience of their management in international markets (Kuo *et al.*, 2012) and rely on more strategic flexibility (Hitt *et al.*, 1998; Harrison *et al.*, 2001). This explanation is supported by the evidence that a firm's extra European Union operativity has a significant positive effect on the investment in JV for family firms.

On the other hand, consistent with H2, we can note that, in general, family firms tend to limit the size of their investment in JVs when there is a predominance of the link type. The level of risk is different in the case of scale and link JVs. A scale JV is a homogeneous cooperation and "the venturer's relationship is similar to that with a third party with whom it has an arm's-length contract, but where the venturer is protected by a guarantee, that is the common control over that third-party" (Laurenco and Curto, 2010). A link JV is a heterogeneous cooperation as it is often created when the venturers come from different industries to enter a new business together and each provides a different and specific contribution in order to develop the new business. In this case, the JV substitutes a contract between the venturers. According to Dussage *et al.* (2000), partners are more likely to

reorganize or takeover link JVs than scale partnerships, whilst scale JVs are more stable and tend to go on without material changes. A link JV is riskier than a scale JV, so, in cases of link JVs, family firms might limit their investment size in order to limit the related risk. This effect is significant only for family firms. They are more risk averse than non-family firms as they are concerned for the business' survival over generations, the firm is a long-term investment that must be passed on to heirs and, for this reason, families are more prone to limit the size of the investment in link type JVs.

Our results point out that HCE is higher for family firms and that the difference is statistically significant. This evidence is consistent with literature highlighting that human capital represents the most important intangible of family firms (Sirmon and Hitt, 2003). Human capital efficiency significantly affects the investment in JVs for all firms but we do not find a particular effect for family or non-family firms, so our results confirm H3. Structural capital efficiency does not increase the investment size in JVs, in spite of its possible role in facilitating the management of a joint venture's different aspects - partner selection, negotiation, contract formulation, and relationship termination – by means of well-constructed organizational structures and in storing and spreading through the organization knowledge acquired by alliances (Chang *et al.*, 2008). A company's resource profile is a relevant component of the alliance formation process, (Stuart, 2000), so, according to our results, human capital has a key role in the development of JV investment size.

Capital employed efficiency has an opposite effect in family and non-family firms. It significantly increases family firm investment size in JVs. As a matter of fact, capital employed efficiency increases a firm's performance and cash flows (Clarke *et al.*, 2011), reducing the need to resort to cooperation with other firms by means of a scale JV in order to assemble the resources needed to operate profitably. This effect might be stronger in the case of non-family firms as they are significantly more prone to constitute scale JVs. On the other hand, more profitable firms have resources available to support new ventures and the development of joint ventures is a viable way for family firms to manage uncertainty while supporting new ventures (Pfeffer and Salancik, 1978) by means of link JVs. JVs create opportunities for family firms to gain access to fresh knowledge and combine it with existing intellectual resources and innovation (Dyer and Hatch, 2006; Nahapiet and Ghoshal, 1998), so that, in instances of high financial performance, family firms might be prone to increase the investment in JVs and to accept the related risk.

Conclusion

This study investigates the effect of the main dimension of socioemotional wealth - family control and influence - on a firm's JV investment size, controlling for the effect of JV type and of the interplay with the other IC components. The results indicate that JV investment size is lower for family-owned businesses than for non-family firms. A strong direct influence of the family on the board, by the means of CEO duality as well as the link type of joint control, reduces investment size in JVs. However, family firms are more prone to investing in link ventures than non-family businesses. Other intellectual capital components do not differently affect family and non-family firms' JV investment size.

The results of this study have implications for family firms and practitioners as they point out how the characteristics of a firm's governance and the choices in terms of board structure may limit their investments in JVs; a viable way for acquiring information, knowledge, and technology and avoiding the effect of conservatism on the management of business.

This explorative study has some limitations. It does not take into consideration a firm's generational stage and its possible moderating effect on family control and influence. Moreover, it focuses on the effect of the first dimension of socioemotional wealth but other dimensions, such as family members' sense of identification with the company and the desire to transfer the business to future generations, might affect JV investments. Future research could go further by studying the effect of the other dimensions of socioemotional wealth in order to develop a multidimensional measurement of family-affective endowment in the firm and analyze the impact of all SEW dimensions on JV investment choices, using different research methods such as surveys and case studies. Furthermore, future research could provide a more detailed analysis by also controlling for the effect of ownership and board characteristics of the other co-venturers that cooperate in a firm's JVs. Finally, our results call for a more detailed analysis on the effect of board diversity in order to better point out the heterogeneity of family firms in JVs investment.

Assessment: We, Giovanna Gavana, Pietro Gottarrdo and Anna Maria Moisello, state that our paper Joint ventures in family and non-family firms was extracted from Gavana, G., Gottardo, P., & Moisello, A. M., (2021). Family control and influence on JV investment-the

moderating effect of JV type and IC components. Journal of Intellectual Capital, 22 (7), pp 68-91, and partially reworked.

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Requirements and measures of the quality of educational services in Poland

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Abstract: Nowadays, education is analysed in terms of quality. Educational service has a specific character, and issues related to its quality are a subject of scientific considerations of researchers interested in this problem for many years. The quality of educational services is undoubtedly a factor influencing the civilization level of the society. Therefore, it seems essential to provide a desired quality of educational services, which is closely related to the quality of teachers' human capital and the school headmaster, i.e. people who create this quality and are responsible for it. This mainly applies to their competences, skills and relations between them. Literature studies in this area lean towards recognizing that one of the factors determining the quality of educational services, and at the same time one of the most important, is the professional training of teachers, viewed in terms of their qualifications and competences as well as their commitment to work. Both the literature on the subject and the legal provisions regulating the discussed issue indicate some imperfections of formal requirements for teachers, which may impact the quality of the educational services they provide. Thus, it was decided that the burden of consideration of this article will focus mainly on the quality requirements of teachers' work, various levels of professional promotion and the important role of the headmaster in this respect. Moreover, attention was focused on issues related to the evaluation of their work. The considerations were based on a literature review on the subject and legislative provisions determining the issues discussed in the article.

Key words: quality of educational services, human capital of teachers, evaluation of teacher's work

JEL: I28, I29

Introduction

Education is one of the most common contemporary services and is defined as a form of social practice focused on shaping both personality and providing knowledge, skills and competences that enable people to live in the society. A critical analysis of the literature on the subject identifies numerous examples that higher quality of human skills in terms of qualifications and professional competences translates into the desired economic growth and social development. Modern theories of growth treat unambiguously the qualifications and competences identified with human capital as the most important determinant of economic development. These theories have been developed since the 1980s, starting with the publication of the works of P. M. Romer. P. M. Romer [Romera & Romer, 1986], R. E. Lucas [Lucas, 1988], and also L. E. Jones, R. Manuelli [Jones L.E. & Manuelli R., 1990, *A Convex Model of Equilibrium Growth*. Available at: https://www.researchgate.net/publication /24108732_A_Convex_Model_of_Equilibrium_Growth_Theory_and_Policy_Implications/do wnload, access date: 02/03/2021].

Characteristically, people are aware that a good education and a willingness to continue deepening the acquired skills translate into their well-being, as acting rationally, while educating themselves, will build foundations for faster economic development of the country. In this sense, care for the quality of educational services is an issue of fundamental social importance. The study was divided into parts. The first one is an introduction to the issues related to the formal requirements for the teaching staff and the school headmaster with regard to the quality of their work based on applicable legal acts and critical analysis of the literature on the subject. In the second part, certain regulations were identified and the focus was put on formal requirements for teacher's work at various levels of professional promotion. Considerations in the last part of the study were supplemented with indicators for assessing the quality of teachers' work and there was made a verification.

The research problem discussed in the article was considered based on the theoretical context, aimed at indicating the theoretical approach to the issues addressed in it and their interpretation, indicating their social and scientific significance, as well as an attempt to establish a theoretical and methodological model of conduct, constituting the starting point for implementation of a research project aimed at enriching the previous discussions in this regard.

Requirements for teachers and the school headmaster in terms of quality of their work

Improving the quality of educational services provided to society by all kinds of educational institutions is assumed to be their main goal. In Poland, evaluation of the quality of education is carried out in schools both on the initiative of the management of individual institutions, as well as the procedures specified by the ministry. The basic activities in this area include:

- lesson observations;
- assessment of the level of implementation of the core curriculum;
- school documentation control;
- evaluation of teachers' work;
- analysis of exam results, attendance and grades, diagnosis of students' needs and skills.

Evaluation can be defined as the process of collecting, analyzing and communicating information on the value of activities undertaken by the school or institution; results of the evaluations are used in the decision-making process aimed at ensuring high-quality organization of the processes of education, upbringing and care and their effects at school or institution [Olejniczak, 2008].

Overall, as reported by Horvathová-Szőkö, evaluation means identifying, comparing and assessing the values of a phenomenon of objective reality on the basis of its characteristics, according to predefined standards, indicators or criteria [Horvathová-Szőköl, 2013]. In addition to this, evaluation is an appraisal of a phenomenon on the basis of the profound knowledge that has been obtained from it, on the basis of any analysis of this phenomenon and understanding how this particular phenomenon in certain situations works [Kolar and Šikulová, 2009].

Evaluation is a dynamic process, which is subject to change in response to challenges:

- resulting from the implementation of strategies and programmes [Olejniczak, 2008]. The specificity of the notion of evaluation is defined by five characteristics referring to this term:
- evaluation is structured and analytical in nature;
- evaluation implies going beyond the canon of a single methodology and turns towards a perspective that combines different tools and data sources of „methodological eclecticism”;
- evaluation is a systematic activity, assuming holistic approach and cyclic and systematic analysis;
- evaluation assesses both the quality and the value of an intervention, going further than scientific research. Evaluation can concern both the initial assessment of the structure of an intervention, i.e. the idea for a programme, as well as estimating the real effects of an intervention [Olejniczak, 2008].

Both the concepts of "rating", "evaluation" and „valuation” are concepts analysed and theoretically explained at the borderline of sociological, psychological, philosophical and pedagogical sciences. They have permanently entered the language, also including the language of strategy connected with the quality of the Polish and global education system [Denek, 2005].

It is worth to quote the definition of evaluation adopted in 1981 by the American Joint Committee on Standards for Educational Evaluation understood as: "[...] *a systematic examination of the value or merits of some object*" [Nevo, 2003]. Developing this term, it can be considered that "[...] the systematic study of the values and characteristics of a particular programme of activity or object, from the point of view of accepted criteria, in order to improve, develop or better understand it" [Norris, 1989]. This concept is identified with estimating, measuring or evaluating, while the core of the term "evaluation" is the category of value [Davis & Dupper, 2004]. In the context of education, this means that the value of educational programmes should be explored using various strategies related to social behaviour. In this sense, then, evaluation is a procedure, conversation, negotiation and planning [Pathon, 1990]. As mentioned above, evaluation in the Polish educational system is currently developed within The System of Evaluation of Education (SEO), which was introduced by the regulation of the Minister of National Education of 2009 [Regulation of the Minister of Education, 2009]. Evaluation is to be one of the forms of pedagogical supervision in addition to control and support. SEO is based on two pillars:

- internal evaluation (self-evaluation), whose main objective is to improve the quality of school work in order to support its development and increase the quality of education. School principals are responsible for conducting this evaluation;
- external evaluation, developed within the framework of the SEO. The role of external evaluation is to assess the extent to which schools meet the requirements set by the state.

The requirements, their criteria and the evaluation procedure itself are described in detail in the appendix to the above mentioned regulation [Regulation of the Minister of Education of August 6, 2015] and constitutes a set of principles for educational supervision, whereas the state requirements for schools and establishments, found in the earlier regulation on the exercise of pedagogical supervision, have found their place in a separate legal act, i.e. in the Regulation of the Minister of National Education of August 6, 2015, on requirements for schools and institutions.

Pedagogical supervision carried out in the form of evaluation is understood as a tool for analysis and communication of information on values, quality of activities undertaken by the school as part of fulfilling the requirements described in the Regulation of the Minister of Education on National Education of August 6, 2015 on the requirements for schools and

institutions. This regulation sets uniform requirements for educational establishments, differentiated according to the specificity of the field of education, but are the same for schools/institutions of the same type. The assessment of whether schools meet these requirements is to be, in principle, uniform throughout the country, which makes it possible to obtain comparable results concerning the quality of Polish education.

Internal evaluation is intended to be a part of everyday school practice and provide information which enables the headmaster and teachers to make valid and justified decisions about their own work and the activities of the whole school.

According to the regulation of the Ministry of Education, the headmaster of a school or centre, in cooperation with other teachers holding managerial positions:

- conducts internal evaluation and uses its results to improve the quality of school work;
- controls the observance by teachers of legal provisions concerning teaching, upbringing and caring activities and other statutory activities of schools and institutions;
- supports teachers in carrying out their tasks by, inter alia, organising trainings and meetings, motivating for improvement and professional development, presenting to the teachers conclusions resulting from the principal's pedagogical supervision [Regulation of the Minister of Education of August 25, 2017].

In order to fulfill the above-mentioned tasks, the headmaster shall, in particular, observe teaching, upbringing and caring activities conducted by teachers, as well as other activities resulting from the statutory activity of the school. The observation may be used in any form and does not have to cover only one hour of class time, it may include a group of classes or a fragment of classes, or it may last, for example, for a whole day in one class. It may include observation of meetings between the teacher and parents, chairing a team meeting, etc.

One of the control activities carried out by the principal in order to assess the quality of work under pedagogical supervision is the inspection of school documentation, e.g.: logbooks of lessons and extracurricular activities, documentation of specialists: the educator, the psychologist, the speech therapist, the vocational counsellor, or the summary of teaching results and behaviour in the annual and final classification. It involves the analysis of documentation and noting any deficiencies to be corrected. Checking is done by the school

principal or an authorised person, e.g. the deputy head teacher or in some cases a regular teacher.

It is assumed that one of the most important conditions for the successful performance of teaching, educational and caring functions by the teacher and the effectiveness in the assessment of their work are competences, which they should be equipped with within the course of education and in-service training.

The pedagogical competence is expressed in the accurate diagnosis, skillful and effective programming, planning and organising of pedagogical activities in lessons and extracurricular activities, controlling and evaluating the effects of student's work in the process of upbringing. A teacher equipped with the above-mentioned competences is someone who:

- is able to develop a concept for work with the class, individual pupils and their parents;
- is able to recognise the initial state of a student's physical development, fitness, skills and knowledge, can interpret the results of tests and examinations appropriately;
- based on the results of the diagnosis (educational diagnosis), is able to program the work with pupils;
- is able to identify the organising factor for learning new skills, information, developing physical fitness and forming attitudes towards culture;
- can set objectives, plan and apply appropriate tasks and in order to achieve them, use the means, methods and organisational forms of pupils' work, selecting them in accordance with the set goals, tasks and conditions;
- is able to activate positive motivation in pupils to complete tasks;
- knows how to use various methods, forms and means of control, analysis and assessment of pupils' achievements, interpret and assess pupils' achievements in relation to their individual abilities;
- is able to determine the reasons for the student's school failures and propose effective ways of eliminating them;

- can recognize typical developmental disorders (neurosis, aggression, maladjustment, use of drugs) and direct the student for the appropriate form of help.

Not without significance is also the teacher's ability to objectively assess the effectiveness of their own work, introducing corrections and planning the concept of their own professional development (self-evaluation).

It is worth emphasising that the educational process should aim at shaping not only well-mannered people, but also people capable of living on their own, to take responsibility for their own mental and physical development, for their fitness and health, people who are competent in these areas.

The person making the decision about choosing a teaching profession should be aware of the need for permanent professional development and training and evaluation, both by the school management as well as students and their parents and the whole society. Raising qualifications should result from the teacher's own willingness and be supported by a well-functioning system [Lisicki, 1995].

The amendment to the *Teacher's Charter*, as well as the amendment to the Act on the Education System, significantly expanded the tasks of the headmaster, whose most important task is to properly organise work in the school, assign duties to teachers, organise work of other school employees, and then constantly supervise the proper functioning of the school. In addition, as a part of his position and supervision, the principal must pay attention to the school's curriculum, teachers' working methods and systems of testing and assessment. The reform of the education system in 1999 led to a broadening of the autonomy of schools, including the possibility of freely developing their own concepts of school work.

In the Polish educational system, in accordance with the provisions of [Educatonal Law Act 2016], the position of school headmaster should be appointed to a person with formal education in teaching, who completed postgraduate studies in management conducted by a college or a course in educational management, which may be conducted by a teacher training establishment, an in-service training centre or another institution, a legal or natural person - if it confers qualifications in a manner required by the provisions of the Polish educational law.

A candidate for school director must also be qualified for the position of teacher in the institution to be managed, the required length of service and a good performance evaluation.

This Act allows for a situation in which a school may also be managed by a person who is not a teacher and who was appointed to the position of headmaster by the leading authority after obtaining the opinion of the body supervising pedagogical supervision. Clearly exposed is the concept of school management by a principal who has been entrusted with the position, and not appointed to the post.

According to the Act on the Education System [Act of September 7, 1991, on the education system], the principal is the head of the workplace for teachers and non-teaching staff employed in a school or institution, who decides on matters related to:

- the employment and dismissal of teachers and other employees of the school or establishment;
- awarding prizes and imposition of regulatory sanctions to teachers and other employees of a school or educational institution;
- making proposals, after a consultation with the pedagogical and school council, concerning decorations, awards and other distinctions for teachers and other employees of a school or educational institution

In addition, Article 7 of the Act on the Charter of Teachers states that the school is managed by a principal who is its external representative, the official superior of all school employees and the Chairman of the Pedagogical Council. In that regard, the terms „directing the school and representing it and representing the school in public" and "head of all the staff" are equivalent to the term "employer". The provisions of the aforementioned act clearly define the tasks to be performed by the headmaster by imposing on him duties to be performed as an employer, as a headmaster exercising pedagogical supervision and a teacher. The headmaster makes decisions, implements resolutions, exercises authority, in other words, he is a leader and a manager.

In the literature, the term "manager in education" refers to a principal who is able to inspire and create conditions for the creative search for new methods and forms of pedagogical and organisational activities of the school. This means that the principal is able to independently and creatively make decisions about the activities of the people they manage, as well as the use of the school's capital and physical resources. For these decisions, the director (manager) bears full responsibility. The aforementioned act defines both who can act as a school director, as well as gives a catalogue of their duties, which include:

- directing the activities of the school or establishment and representing it externally;
- carrying out pedagogical supervision;
- taking care of pupils and creating conditions for harmonious psycho-physical development through active pro-health measures;
- carrying out the resolutions of the school or educational board and the pedagogical board adopted within the scope of their competences;
- disposing of funds specified in the school's or establishment's financial plan and taking responsibility for its proper use, as well as organising the administrative, financial and economic management of the school or establishment;
- performing tasks related to ensuring safety of pupils and teachers during classes organised by the school or establishment, performing other tasks resulting from specific provisions;
- cooperation with colleges and teacher training establishments in the organisation of teaching practice;
- responsibility for the proper organisation and conduct of tests and examinations conducted at the school or establishment;
- creating conditions for the activities of e.g. volunteers at the school or establishment, associations and other organisations, in particular scouting organisations, whose statutory objective is educational activity or extending and enriching the forms of teaching, upbringing and caring activities of the school or establishment.

The list above only indicates selected tasks of the school director, but is not exhaustive. The task of a principal who aims to be a leader in his institution is to provide leadership and take corrective action to make the most of the potential of the team. Therefore, it seems justified to reflect on the school's mission and vision and to review the defined values of the goals. The headmaster as a manager can and should be seen as a leader who creates conditions for the team to work and develop, and who shapes their beliefs, visions, values and attitudes. Furthermore, planning, measuring, budgeting, controlling, organisation, i.e. the management of an educational institution are also important tasks for the headmaster.

Today's schools undoubtedly need a group of responsible leaders, who could lead and guide the process of change. This is particularly important in the context of specific establishments and in specific situations.

Therefore, the quality of educational services appears to be particularly dependent on the work and professional attitude of the headmaster, including how he is perceived by subordinate teachers. Managing a school, achieving high quality of provided educational services requires from the principal competences and skills in many areas. A principal should be a good manager, strategist and tactician, politician, mediator and psychologist.

A very important skill of a good headmaster is the ability to kindly point out mistakes and help in their elimination, and therefore the appropriate psychological predispositions. The essence of the director's actions is also the ability to create such conditions of work, learning and comprehensive intellectual, emotional and socio-educational development of pupils so that by the statutory deadline, they will graduate from school, equipped with appropriate level of knowledge, skills and competences. It should enable them to continue their education at the next higher level chosen according to their interests, talents and skills, or to enter the labour market and become a full member of the community.

Another important factor inseparably connected with the quality of educational services, which influences the achievement of appropriate results, is the level of pedagogical supervision exercised by the school principal. The purpose of pedagogical supervision itself is improving the quality of education, upbringing and care in schools. However, a different approach to the performance of pedagogical supervision by the headmaster includes the development and organisation of the measurement of the quality of school work, the use of the results of these studies in planning the development of the school, activities aimed at increasing the quality of work of the school, inspiring, collecting materials for evaluating the work of teachers, substantive and organisational support for young teachers. Quality teaching, qualitative development of teaching and schools are the aims of pedagogical supervision.

The director of a modern educational institution is an educational manager who, on behalf of the school’s owner, independently and creatively makes decisions on school matters. It is a professional manager of an educational institution, whose duty is to manage the school in a democratic way in cooperation with the local community.

The ongoing changes in the educational system increase the demand for creative educators, characterised by initiative, ability to think and act on a school-wide scale. Both the teacher and the headmaster, in order to meet the expectations of the society, should keep improving their didactic and pedagogical skills throughout the whole period of professional activity. It is also the basis for promotion to the next ranks in the service hierarchy. The requirements to be met by every teacher to obtain the next level of professional promotion are given in the previously quoted Regulation of the Ministry of Education. Achieving the skills set out in this document requires time and a lot of work. However, it brings the expected results. On one hand - the satisfaction of pupils and parents, on the other - personal satisfaction and appreciation of the surroundings. It seems, therefore, that the process of teacher training improves the quality of school work, helps to introduce changes and modify the work with pupils.

Formal requirements for teachers' work at different levels of professional advancement

The quality of educational services is created mainly by the teacher, his personality, qualifications and competences as well as, what is particularly important, an innovative approach to their work. The teachers employed by a school are assumed to play a key role in the lives of its pupils, showing them goals and shaping their perceptions of the world. According to the provisions of the Act on the Educational System, a teacher should be guided in his didactic, educational and caring activities by the good of pupils and care for their health, moral and civic attitude, with respect for the personal dignity of the pupil. Moreover, a teacher in his work should realize the basic forms of of didactic and educational activity of the school, which are defined in the Act:

- compulsory and additional educational activities and optional extracurricular activities;
- teaching-equalizing and specialist classes organized for students with learning difficulties and other classes supporting the development of children and youth with developmental disorders;
- providing vocational education in schools - practical vocational training [Act of September 7, 1991, on the education system].

In terms of rights and obligations, the Act refers to the Teachers' Charter [Act of January 26, 1982, Teacher's Charter], which obliges education employees to:

- carry out tasks connected with teaching, educational and caring functions of the school in a reliable manner, including ensuring the safety of pupils;
- support each pupil in his or her development;
- strive for the fullness of their own personal development;
- educate and bring up young people in respect for the Homeland and the Constitution of the Republic of Poland;
- shape moral and civic attitudes in young people, taking into account democracy and tolerance;
- improve general and professional knowledge.

The reform of the educational system in Poland introduced professional promotion levels to encourage and oblige teachers to continuous development, including the improvement of their qualifications. The competences necessary for obtaining the particular degrees of professional development were defined as precisely as possible [Pielachowski, 2001]. Thus, Table 1 is a reference to the different levels of teachers' professional promotion in terms of qualifications and competences required for particular positions, the duration of the internship and the form of application for a higher level of teacher promotion.

Table 1. Requirements for the positions of trainee teacher, contract teacher, appointed teacher and certified teacher

Position (duration of internship)	**Qualifications and competences required for the position**
Trainee teacher (9 months)	has formal, i.e. education-based, professional qualifications to work as a teacher of a given subject
Exam before an examination board appointed by the headmaster	
A teacher may begin internship as a contract teacher at the beginning of the following school year	
Contract teacher (2 years and 9 months)	- has the qualifications required for the post of teacher trainee; - has qualifications and competences which enable them to teach in a way ensuring the proper implementation of the statutory tasks of the school in which the teacher served his traineeship, in particular, the implementation of the core curriculum;

	- knows the pupils' environment, its problems and is able to cooperate with the local community; - is able to recognise the needs of pupils and individualise the process of learning; - is able to discuss their own or observed activities; - knows the organisation and functioning of the school; - applies knowledge of psychology, pedagogy and didactics at work; uses multimedia and IT tools during classes
Exam before an examination board appointed by the school leading body	
A teacher may begin in-service training after having worked at a school for at least two years fromhaving obtained the grade of contract teacher	
Appointed teacher (2 years and 9 months)	- has the qualifications and competences required for the post of contract teacher; - achieves positive results in teaching, educational and caring work as a result of implementing actions aimed at the improvement of own work and the improvement of the quality of the school work; - is able to organise and improve its workshop, use work methods that activate students, evaluate their own actions, increase their effectiveness and make changes in these activities; - is able to use modern technologies at work and is able to apply knowledge of psychology, pedagogy, didactics and general issues in the field of education, social assistance or proceedings in juvenile matters in solving problems related to the scope of its tasks; - knows how to apply the regulations concerning the educational system and social welfare in the scope of functioning of the school, in which he was a trainee for promotion
Interview before a selection committee appointed by the school supervisor	
A teacher may begin internship as a qualified teacher after having worked for at least one year from having been conferred the previous grade of professional promotion	
Certified teacher (2 years and 9 months)	- development and implementation of a programme, innovation or other teaching, educational, caring or other activities related to education, connected with the specificity of a school, in particular for pupils with special educational needs; - performing the tasks of internship supervisor, supervisor of pedagogical practice, teacher - methodical advisor, chairman of the team of teachers, coordinator of voluntary service, project coordinator, social curator, examiner of the District Examination Commission, textbook expert; - development of authored work in the field of education or child development published in a professional journal or other compact publication; - have competence in a foreign language at an advanced level, and, in the case of language teachers, have basic skills in a second foreign language

Source: own work on the basis of art. 9a-9i of the Act of January 26, 1982 - Teacher's Charter (Journal of Laws 2018, item 967) and the Regulation of the Minister of National Education of July 26, 2018. on obtaining professional promotion degrees by teachers (Journal of Laws 2018, item 1574).

A teacher in a school can become a person who meets certain qualification requirements. In a public school, the basic legal act regulating the employment of teachers is the Act Teacher's Card (TC) [Act of January 26, 1982, Teacher's Charter], while in a non-public school with the privileges of a public school, only some of its provisions apply. Selected

issues are also regulated by the Labour Code. According to the provisions of the LC, a teacher employed in a public school must:

- hold a university degree with an appropriate pedagogical preparation, or
- complete a teacher training establishment and take up a post for which they are sufficiently qualified;
- respect basic moral principles;
- meet the health conditions necessary for the exercise of their profession.

The principles of professional promotion of teachers are defined in the TC and in the Regulation on obtaining professional promotion by teachers [Regulation of the Minister of National Education of July 26, 2018, obtaining professional promotion grades for teachers]. Four levels of professional promotion are distinguished: trainee teacher, contract teacher, appointed teacher and certified teacher.

Trainee teacher - is a person who has the appropriate professional qualifications for the position of a teacher, but does not have another level of professional advancement. One becomes a teacher trainee from the first day of employment at school, except for university teachers with at least three years' seniority in higher education and other persons with at least five years' seniority and significant academic achievements who, on the date of their appointment at the school, are promoted to higher grades of promotion. A trainee teacher seeking promotion to the rank of a contract teacher during the in-service training period should, in particular, fulfill the conditions set out in it, i.e: become familiar with the organisation, tasks and functioning of the school, participate as an observer in classes conducted by the internship supervisor or other teachers, conduct classes with students in the presence of the internship supervisor or another teacher and discuss them with the supervisor and the school principal. The teacher should also participate in in-service training, especially in the field of improving working methods and forms.

A contract teacher seeking promotion to the rank of appointed teacher during his in-service training shall in particular:

- participate in the work of school bodies related to the implementation of school tasks and the needs of the local environment;
- improve competences, in particular regarding the education of pupils with special educational needs, including gifted pupils;

- conduct classes in the presence of the internship supervisor and the headmaster and discuss them with the person in whose presence the lesson was conducted;
- conduct at least 2 hours of open lessons for teachers in the school and evaluate them in the presence, if possible, of a teacher-methodological advisor in the field of these activities.

Both in-service teachers and contract teachers undergoing an internship the headmaster shall be assigned a mentor among the nominated or certified teachers.

Both trainee and contract teacher, as well as appointed teachers, applying for a higher level of professional promotion attach a draft of their professional development plan to the application for the commencement of internship, which is submitted to the headmaster. The headmaster approves the draft of the teacher's professional development plan or returns it to the teacher for improvement, specifying the scope of changes. The teacher is obliged to immediately improve the draft of professional development plan in accordance with the recommendations of the headmaster and resubmit it.

The final step in the professional promotion of teachers is a certified teacher. An appointed teacher seeking promotion to the rank of certified teacher during the in-service training should, in particular:

- take actions aimed at improving their workshop and working methods, including perfecting the skills of applying information and communication technology;
- carry out tasks aimed at improving the quality of school work;
- expand knowledge and skills serving their own development and improving the quality of school work, independently or by participating in various forms of professional development;
- conduct at least 3 hours of open lessons for teachers and evaluate them in the presence, if possible, of a teacher-consultant within the scope of these activities, a teacher-consultant or a representative of the body responsible for pedagogical supervision.

A certificated teacher who has at least 20 years of work experience in the teaching profession, including at least 10 years as a certified teacher, as well as significant and recognised professional achievements may, upon the proposal of the Chapter for Professors

of Education [Act of January 26, 1982, Teacher's Charter], be conferred by the minister responsible for education and upbringing the honorary title of professor of education.

Table 2 presents the changing structure of teaching positions based on the example of the school years 2009/2010 and 2019/2020.

Table 2. Quantity and percentage structure of teachers by the career advancement degree in Poland - comparison of the school years 2009/2010 and 2019/2020

Degree of professional promotion	Percentage structure	Number of teachers	Percentage structure	Number of teachers
	2009/2010		2019/2020	
Trainee teacher	4.60%	22 766	3.94%	20 241
Contract teacher	19.40%	96 012	15.90%	81 704
Appointed teacher	31%	153 421	19.13%	98 304
Certified teacher (Chartered)	43.40%	214 790	56.06%	28 8080
Teacher without a degree of professional promotion	1.60%	7 918	4.97%	25 538
Total	100%	494 907	100%	513 868

Source: own work on the basis of stat.gov.pl.

The level of the basic salary depends on the teacher's professional promotion grade, qualifications and the compulsory teaching load. The level of allowances is determined by the length of service, the quality of teaching, additional tasks or activities, the position held and difficult or hazardous working conditions.

The Teachers' Charter Act regulates the minimum average salary of teachers with different levels of professional promotion, which is equal to the following percentages of the reference amount established annually for teachers in the Budget Act. According to this, the average salary for individual positions should be [21]:

a) for a trainee teacher: 100%;
b) for a contract teacher: 111%;
c) for appointed teacher: 144%;

[21] *Art. 30 of the Act of 26 January 1982. - Teacher's Charter (Dz. U. 1982 nr 3, poz. 19 z późn. zm.).*

d) for a chartered teacher: 184%.

The data shows a growing share of the highest-paid chartered teacher positions in the full time structure. Moreover, it means that they gain successive degrees of professional promotion, which results in allocating more and more funds to the salaries of teachers allocated to education in Poland.

The structure of public expenditure on education in PLN billion and in relation to GDP in 2005-2018 is presented in Table 3.

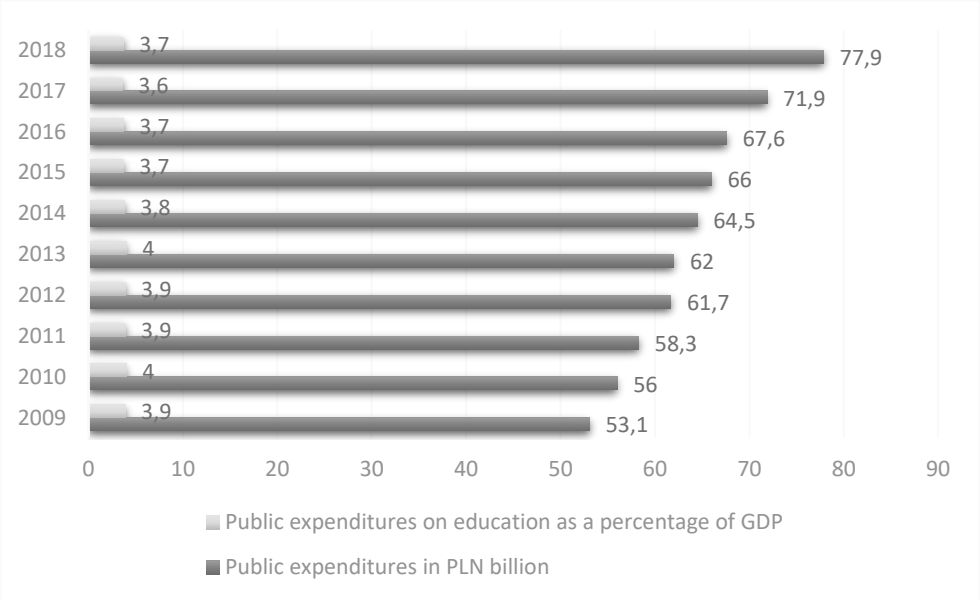
Table 3. Public expenditures on education in Poland, 2009-2018 (%of GDP)

	Public expenditures in PLN billion	**Public expenditures on education as a percentage of GDP**
2009	53.1	3.9
2010	56.0	4.0
2011	58.3	3.9
2012	61.7	3.9
2013	6.2	4.0
2014	64.5	3.8
2015	66.0	3.7
2016	67.6	3.7
2017	71.9	3.6
2018	77.9	3.7

Source: own work on the basis of stat.gov.pl.

For better visualisation, the graph below allows to notice the overall trend in data and understand the comparison results between two groups.

Figure 1. Public expenditures on education in Poland, 2009-2018 (%of GDP)



Source: own study

The presented data indicate a systematic increase in public expenditure on education with a relatively stable share of this expenditure in GDP in Poland.

The greater financial resources devoted to education are mainly related to the increase in teachers' salaries due to their professional promotion.

Measures of the quality of teacher's work

The quality of a service is measured by its effectiveness, which is defined as the highest possible volume of knowledge transferred in the shortest possible time, with the least possible effort and financial outlay [Mihaela, 2012]. The literature underlines the close relationship between the quality of the educational service and the satisfaction of its recipients. Authors M. Purgailis and K. Zaksa [Purgalis & Zaksa, 2012] divide the elements of the quality of educational process into quality of the result, quality of the process, quality of teachers and quality of the school environment.

The literature also emphasises the important role of systematic assessment of the school environment and managing the quality of that environment by focusing on the needs and requirements of students in order to improve educational practices. Changes brought about by the results of the school environment assessment generate greater motivation and

willingness to cooperate among its members, which translates into an improvement in the quality of the whole educational process [Staukalina, 2008].

Under the rules in force, a teacher's work, with the exception of that of a trainee teacher, is a subject to evaluation. Evaluation of a teacher's work may be done at any time, but not earlier than one year after the previous evaluation or the evaluation of professional achievements [Act of January 26, 1982, Teacher's Charter]. The evaluation of work is valid until the teacher is re-evaluated.

In light of the current regulations regulating the evaluation of a teacher's work, a teacher is obliged, primarily:

- to diligently perform the tasks connected with their entrusted post and the basic functions of the school: didactic, educational and caring, including tasks connected with ensuring the safety of students during classes organised by the school;
- to support each student in their development;
- to strive for full personal development, improve themselves professionally in accordance with the needs of the school;
- to educate and raise young people in love of their homeland, in respect for the Constitution of Republic of Poland, in an atmosphere of freedom of conscience and respect for every human being;
- to take care of shaping moral and civil attitudes in pupils, in accordance with the idea of democracy, peace and friendship between people of different nations, races and beliefs [Act of January 26, 1982, Teacher's Charter].

The subject of the evaluation is the overall professional performance and the fulfillment of teacher’s duties as a degree of realisation of statutory tasks. In addition, it is assessed whether a teacher in his didactic, educational and caring activities is guided by the good of pupils, cares for their health, moral and civil attitude, respecting the personal dignity of the pupil. The cited regulations do not indicate strict criteria for the assessment of a teacher's work, but only a general catalogue of the teacher's basic duties. More specific criteria are indicated in the Ministry of Education Regulation [Regulation of the Minister of National Education of May 29, 2018, on the detailed criteria and procedure for evaluating teachers' work, the scope of information contained in the work evaluation sheet, the composition and method of appointing the evaluation team and the appeal] in accordance with the provisions of which, among others:

- evaluation criteria are detailed according to the stage of professional development of the teacher being evaluated;
- an additional criterion was introduced for all teachers who have completed internship / professional development plan;
- written opinions on a teacher's performance must include a justification, which will be attached to the performance appraisal form;
- the evaluation sheet should contain a justification, including reference to whether the teacher meets the individual criteria;
- the degree to which the criteria are met is set as a percentage, i.e. in the case of setting the level of meeting the criteria for evaluation of the teacher's work at the level:
  a) not less than 95% - the teacher receives a distinction grade;
  b) not less than 80% - the teacher receives a very good mark;
  c) not less than 55% - the teacher receives a good mark;
  d) less than 55% - the teacher receives a negative mark;
- the procedure for appeals against evaluation introduced the obligation for the evaluation team to hear the teacher who lodged the appeal. Failure by the teacher to appear will not prevent the evaluation team from considering the appeal and reaching a decision consisting in:
  a) upholding a performance appraisal;
  b) cancellation of the performance appraisal and the establishment of a new one, or
  c) repealing the performance appraisal and refering the case back for a new determination.

Performance appraisal is carried out every 5 years from the date of obtaining the rank of contract, appointed as well as certified teacher. This means that in the case of contract and appointed teachers (unless in the meantime the teacher starts a training for a higher level of professional promotion), performance appraisal is carried out only after the end of the internship.

According to many stakeholders, the current criteria for teacher’s performance appraisal raise a number of doubts. There are no precise regulations on this subject, they are

vague and ambiguous. Teacher's performance appraisal processes are subjective and lack a clear criteria. The internal documents detail these criteria, which means that assessment based on clear principles will not be controversial among teachers. The various types of school rules and regulations are far more useful than, and certainly complement, the general wording of the assessment acts and regulations. Thus, the development of indicators for each aspect of assessment is essential to the quality of the school.

It is also questionable, on one hand, that it is not possible to adapt all the general criteria to the individual levels of professional promotion, disregarding the specificity of work in the position held, and on the other hand, too much discretion and freedom in evaluation additionally raises objections and causes anxiety.

An aspect of evaluation that is also controversial is the complete elimination of parents and pupils from the teacher's evaluation system, all the more so because it is them who is the direct recipient of the teacher's work and it is them who feel its effects the most. The parents' council has a right to request an evaluation of a teacher's work but in practice this provision does not function.

It should be noted that both the literature on the subject and the school environment express concerns that the evaluation formula, set out in the Teacher's Charter, does not improve the quality of school work, but causes bureaucratic burden, which becomes a tool for antagonising the educational environment.

Without negating the point of teacher's performance appraisal in any way, it is important to point out the need to set a new direction for changes in the procedure of the present system of evaluation of teacher's performance in Poland. In an attempt to indicate such direction, attention should be drawn to the works of H. Martins, S. Loureiro and M. Amorim [Martins, Loureiro & Amorim, 2013], who are of the opinion that a full evaluation of the quality of the educational process should include opinions and evaluations of internal and external stakeholders of the school and its graduates.

Methodology

The concept of methodology is inextricably linked with the issue of scientific research. When defining the presented scientific problem, one should define the method proceedings in order to achieve the intended goal [Sławińska, 2008]. Usually when solving a specific research problem, one method is assumed as the leading one and the others are auxiliary methods [Pieter, 1975]. J. Pieter to the essential working research methods includes:

- observational;
- experimental;
- statistical;
- constructive;
- source criticism;
- comparative;
- logical analysis [Apanowicz, 2002].

This study is assumed to be the result of a critical analysis of the literature on the subject and the legislative framework in force in this respect, which is only a basis for a specific research procedure in the field of requirements and measures identification of educational institutions in Poland.

The selection of sources for the analysis was made in relation to the purpose presented in the study. It should be noted, however, that this is not an exhaustive analysis due to the issue under consideration, which has been recognized as complex, interdisciplinary concept, multi-threaded. Therefore, the subject of the literature review was mainly:

- scientific works from various disciplines;
- popular science, journalistic and methodical publications;
- scientific articles;
- applicable legal regulations.

Properly conducted research should, in principle, be a source of information which can be properly used. Information is an economic good possessing the characteristics of the product, so it can be sold and bought. Information is for many organizations, especially in a competitive market, a serious tool of competition. Information is also an essential component of decision-making processes. In that sense it has two basic spheres of application, it is the starting point for making decisions and a tool for controlling the implementation

of these decisions [Hayek F., *The use of knowledge in the economy*. Available at: http://coin.wne.uw.edu.pl, access date: 02/28/2021]. They should be distinguished in terms of both the subjective and objective sense of the information obtained. In the objective sense, information means a mutual relationship between at least two objects, composed of the meaning (content) and the physical medium (form) which serves to transmit the signals of one object to another. In the subjective view, information is understood as a set of specific activities for manufacturing, processing, storing, exploring, sharing and receiving messages concerning a specific subject [Ratajewski, 1973].

In the literature on the subject, one of the main divisions of research methods is distinguishing the quantitative and qualitative methods. The qualitative approach involves a research of a given phenomenon by recreating the internal perspective of people shaping this phenomenon. The quantitative approach comes down to scaling the studied phenomenon and their numerical value (percentage) of parameterization.

It is admitted that the problem may be the adoption of certain methodological assumptions with regard to the examined problem, which should take into account all the imperfections and the difficulties of applying a given research method.

Summary

To sum up these considerations, it should be stressed that particularly important, in the context of the quality of educational services, is to perceive the teaching staff as a group of cooperating teachers whose coherent, pro-quality activity determines the perception of the school in the environment, which translates into interest in taking up education in a given school by students and consequently translates into educational success of a student.

Thus, the development of education, especially the universality of education at all levels, requires constant care and control over the quality of education and creation of systemic solutions supporting the improvement of this quality.

The theoretical background concerning both the requirements for teachers in terms of quality of their work and at different levels of professional promotion, as well as the role of the school principal in this respect, referencing literature and recalling the most important legal regulations by no means exhausts the presented issue and is only one of many

approaches, thus constituting an incentive to expand reflections and research on the quality of educational services in Poland.

Achieving this objective has provided a lot of interesting and useful information, allowing a better understanding of the presented issues.

The reflections undertaken in the article may provide a platform for further discussion on the quality of educational services in Poland, considered in this study only through the prism of the requirements imposed on the teaching staff and headmasters, as well as quality measures of their work.

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Transformation of Property Register in the Digital Age: Evidence from Ukraine

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Abstract: The article is devoted to the problem of the need to transform the property register on the example of Ukraine. Existing registers do not accumulate all the necessary information on property, while the effects of unauthorized concentration and hidden monopolies are present in many countries around the world. Concentration of ownership poses a threat not only due to the deterioration of the economic situation, business activity of many market participants, but also due to the threat to the economic security of the country. Antitrust law does not always effectively regulate antitrust actions and focuses more on changes in ownership (ownership shares, asset values). However, most cases of concentration and hidden monopolies occur in terms of use and disposal, in particular through the institution of trust management. It is proposed to create a single property register, which will have a completely new approach to grouping information and its use. Information on property of both individuals and legal entities is proposed to be provided using matrices based on the triad of property rights: ownership, use and disposal. This information should be accumulated from all existing registers. The elements that will form the matrices will be considered both from the standpoint of the owner and from the standpoint of the beneficiary. The data of the unified property register will be useful both for antitrust regulation and in assessing the feasibility of property transformations by public authorities for decision-making on privatization. The authors suggest that consolidating all information into a single register would not only prevent veiled forms of concentration and provide more effective regulation of property transformations, but become the basis for the formation of the ownership history of each entity such as credit history. We believe that digitalization processes can significantly help to improve the register and provide new opportunities for collecting and creating a database.

Keywords: database, propertyregister, concentration of capital, property transformation

JEL: H1, L12, L33,L4, L5, O33, P14

Introduction

Property in all its manifestations remains a key factor in economic development. Transformation of ownership is closely linked to the creation of new innovative products, and it provokes the formation of technological cycles. As a result, it is extremely important, from

the standpoint of state and regional development, to assess and control the ownership structure, as well as the change of all its factors that affect the transformation of property itself. All available information about the owners is accumulated in the registers, each of which has its own purpose. However, despite the understanding of the importance of this issue, we see a number of negative consequences of property transformations, particularly in Ukraine. It is a question of concentration of property at legal and physical persons, as well as at observance of all norms and requirements of the antimonopoly legislation.

The concentration of capital on a state-controlled scale makes it possible to scale economic activity and develop it. However, uncontrolled concentration can lead to negative consequences. Of particular concern is the uncontrolled concentration of ownership of strategic enterprises, the owners of significant stakes in which are registered in other countries. Therefore, we can talk not only about transparent market relations, but also about the economic security of the country. However, the usual tools for valuing property and the owner, which are partially reflected in the registers, often do not work. The reason is that hidden concentrations, and later monopolies, arise not so much in terms of concentration of ownership but use, and especially disposal of property. Unauthorized associations are most often the result of abuses in trust management and difficulties in identifying the final beneficiaries.

Consequently, we assume that the transformation of the property register with all the opportunities provided by digitalization, namely the accumulation of the necessary information from the registers that reflect all possible changes that occurred with the property from the owner's position in the alienation of property, and from the position of the beneficiary, will help to manage problematic issues. Bringing all the information into a single register would not only prevent violations and ensure more effective regulation of property transformations, but also become the basis for the formation of the property history of each business entity, such as a credit history.

Theoretical premises

The category of property belongs to both economic and legal categories. Historical analysis of the development of the institution of property allows us to conclude that it was and still is the foundation, the basis for the development of any state and its legal system.

Property relations arose in the early stages of society. Nowadays, they are evolving together with new innovative challenges dictated by the digital age.

Property is not a thing and not just relationship of people to things, but relationship between people that can be related to things.

According to Breakey, H. and Simashenkov, P., property was mentioned by the Roman lawyers in terms of ownership, the right to use, right to dispose, right to receive income, right to exact a thing [Breakey, H., 2011, p. 240, Simashenkov, Pavel, 2018, p. 237], However, Glackin, S. specifies that the last two powers of the owner later ceased to be used, and the powers of ownership, use and disposal were called the classical triad and were perceived by most modern legal systems as the traditional and most abstract definition of the content of property rights [Glackin, S., 2014, p.14].

Developing the economic nature of ownership, it is important to note that the objects of property relations can be both tangible and intangible resources, and the subjects – people, associations of people, labor collectives, and representatives of the state.

We agree with Pozner E. A., Vejl E. G. that property transformation can take place not only in the 'public – private' range [Pozner E. A. & Vejl E. G., 2018, p.344]. If certain changes occur in the property itself, namely when the restructuring takes place, the property is to some extent transformed as well, because a number of features change. The restructuring of the enterprise is carried out in order to improve its activities (a certain recovery) [Van Erp, S. (2016)]. It is impossible not to take into account such types of restructuring as mergers, acquisitions, divisions, leases, sales of part of the property, which we call forms of microtransformation of property and propose to use to form matrices of a single property register.

However, the issue of how to effectively use information on property transformations to prevent and avoid institutional disparities, in particular by transforming existing registers into the most convenient and useful property register, remains insufficiently covered in the scientific economic literature. The issue of choosing the method of forming the register database and its structure also remains unsolved.

Methodology

The article provides an implementation of the matrix method of grouping information, which is proposed by the authors for the formation and effective use of the proposed Unified Property Register and will be described in more detail in subsequent publications of the authors. Given the proposal to analyze various forms of ownership transformation from the standpoint of ownership, use and disposal, the authors propose to group databases of information in a matrix.

If the owner owns, uses and disposes a particular object, this condition can be characterized by three indicators:

1) ownership O – reflects the market value of the property;
2) use U – reflects the potential profits that the owner may receive as a result of using the object;
3) disposal D – reflects the potential income that the owner may receive as a result of the disposal of the object (sale of a share or a part of it, lease, etc.).

Accordingly, this characteristic can be written as an expression

(1) $$(O_i U_i D_i)$$

If the owner owns, uses and disposes n-objects, it can be described as follows

(2) $$\begin{pmatrix} O_1 & U_1 & D_1 \\ O_2 & U_2 & D_2 \\ \dots & \dots & \dots \\ O_n & U_n & D_n \end{pmatrix}$$

Obviously, some objects can only be owned or used or disposed by the owner. There are also options when 2 out of 3 conditions are met. In this case, all possible combinations of these situations are used. For example, if you consider the lease of real estate, then from the standpoint of the tenant, this matrix of ownership will look like he/she does not own it, but uses and does not dispose. From the point of view of the property owner, the owner owns it, but does not use it, but disposes it if he/she is an adult and if the property is not encumbered by litigation.

Thus, the possible elements of property matrices will look the following:

OUD – ownership-use-disposal

OnUD – ownership -non-use-disposal

OUnD – ownership-use-prohibition-disposal

OnUnD – ownership -non-use-prohibition-disposal

nOUD – non-ownership-use-disposal

nOnUD – non-ownership - non-use - disposal

nOUnD – non-ownership -use-prohibition-disposal

nOnUnD – insufficient or no access to ownership - insufficient or no access to non-use - prohibition of disposal

There are examples of each of these elements of the matrix in economic and legal practice. Some of them will be considered in this study.

The paper also explores the role of trust management, which has a number of shortcomings. They relate to the tendency to create hidden monopolies in the absence of official violations of applicable law.

Results

Information on property relations is reflected in the registers, which are used primarily by state regulatory authorities. In particular, in Ukraine, the main register is the Unified State Register of Legal Entities, Individual Entrepreneurs and Public Associations. But it is related neither to the State Register of Real Property Rights, nor to the Register of Court Decisions or stock market participants and other registers that create a useful database, but each operate separately, without forming a general picture of change of ownership in society.

It is important to monitor changes in the ownership structure. First, they are the first signal of possible structural disparities in the national economy. Second, they inform about the threat of excessive concentration of capital due to property transformations. Concentration is the process of merging enterprises, companies and other market assets, as a result of which the economic power of market participants increases [Kryukov Victor V., 2020, p.36]. Concentration is determined not only by the acquisition of shares, but also by the creation of new enterprises, the transfer of certain objects for rent, as well as the appointment of managers of large companies. All large concentrations must be agreed with the Antimonopoly Committee.

In accordance to different characteristics the following transactions (agreements) and actions of business entities are recognized as concentration:

- merger of business entities or accession of one business entity to another;

- acquisition directly or through other persons of control over economic entities or parts of economic entities, in particular by: a) direct or indirect acquisition, acquisition of assets in another way, acquisition, management, rent, leasing, concession or other acquisition of rights; b) appointment or election to the position of head, deputy head of the supervisory board, board; [Khalikov A., 2013, p.47]
- purchase, acquisition of ownership in another way or receipt of shares (shares, units), which ensures the achievement or excess of 25% or 50% of the votes in the supreme governing body of the relevant entity.

The negative consequences of property transformations include tendencies to its concentration, in particular among beneficiaries registered in other states. Unlike foreign direct investment, which is important for economic development, investment from foreign legal entities and individuals who are not the final beneficiaries can pose a number of threats in high concentrations. Despite the requirements of the Ministry of Justice to disclose information about the final beneficiary, reports [Report of the State Financial Monitoring Service for 2019] proved that this requirement was often violated, favoring the payment of a fine.

After analyzing the data on significant participation in the ownership of the Ukrainian enterprises (10% of shares and more), a number of conclusions can be drawn. First of all, given the geography of registration of business owners, we see that most countries belong to the offshore zones. On the example of fuel industry enterprises (Table 1), we see that Cyprus is the country with the largest number of beneficiaries-owners of the key Ukrainian enterprises. A similar situation is observed in the chemical industry, in the fields of ferrous metallurgy, mechanical engineering, transport.

Table 1 Owners of Shares of Fuel Industry Enterprises with Significant Share of more than 10%

Name of Enterprise	Beneficiary Country	% of share
DTEK Energovuhillya ENE PJSC	Netherlands	100
Odesa Oil Refinery Plant PJSC	Cyprus	99.6
Institute of Oil Transportation PJSC	Cyprus	76
Naftokhimik Prykarpattya PJSC	Virgin Islands (British)	38
DTEK Pavlohradcoal PJSC	Netherlands	60
Halychyna Oil Refining Complex PJSC	Virgin Islands (British)	38
Ukrtatnafta Transnational Financial and Industrial Oil Company PJSC	Cyprus	37
Naftoavtomatyka PJSC	Virgin Islands (British)	16
Ukrnafta PJSC	Cyprus	27
Diesel Plant PJSC	Virgin Islands	12

Source: own elaboration on the basis of property statistics

Furthermore, of noticible worth is the power industry, which is strategic, but some power plants are almost entirely owned by foreign companies.

Owners of enterprises related to the financial and insurance market of Ukraine are also registered with significant participation. In particular, 37% of the shares of Oranta National Joint-Stock Insurance Company PJSC belong to a beneficiary registered in Kazakhstan and 25% in Cyprus. Joint-Stock Commercial Industrial and Investment Bank PJSC is 99.8% owned by a legal entity registered in the Russian Federation, and Ukrsotsbank JSC is 100% owned in Luxembourg.

The main reason for the concentration of property outside Ukraine is the attempt of its owners to protect it from the possibility of unauthorized redistribution, raids, which took place during political crises in the ‘power-property’ cycle.

Another reason for registering beneficiaries in many offshore countries is tax avoidance. For Ukraine, this is a significant loss to the state budget as a result of previous transformations and political crises.

Therefore, the registers often show the result of the change of ownership and do not help in the effective assessment and prevention of threats from the negative consequences of such property transformations.

The main body of state control and regulation in Ukraine regarding the concentration and protection of economic competition is the Antimonopoly Committee of Ukraine, which makes the decision on granting permission for mergers and acquisitions, additional increasing of share ownership, which can lead to the increase of concentration. It is also analyzed whether such a concentration does not lead to monopolization or restriction of competition in the market.

The Antimonopoly Committee monitors the level of capital concentration and takes the first steps in reforming antitrust legislation required by the Memorandum with the MIA. An example of legislative changes is the development of the Procedure for submitting to the Antimonopoly Committee of Ukraine applications for exemption from liability for violations of the legislation on protection of economic competition.

However, it should be noted that the Antimonopoly Committee of Ukraine uses a far from perfect methodology for assessing the possible concentration of capital, which is based only on the analysis of assets, sales of goods, works, services and calculation of aggregate shares in commodity markets. This is not enough, because most abuses in terms of invisible concentration occur due to certain transformations not so much in terms of ownership as in use, and especially in the form of disposal through beneficiaries, to whom the main owner entrusts the right to dispose their property. Trust management is a fairly common type of management in world practice. Therefore, it is important to monitor its manifestations, which would accumulate in the Unified Property Register.

The focus is drawn to the information support of this register. The authors assume that the elements of the matrix approach, which is the basis of the Unified Property Register, will be the result of transformations accumulated from all registers and databases. Examples of elements of the matrices of the owner in the alienation of property or for the beneficiary are shown in Table 2 and Table 3.

Table 2. Forms of Ownership Transformation when Ownership Passes from Owner (not only Alienation)

(non) Ownership, / (non) Use, (non) Disposal	UD	nUD	UnD	nUnD
O	- Full ownership before transformation - Barter -Privatization (corporate rights of the state >50%) -Reprivatization (corporate rights of the state >50%) - Nationalization	- Concession (in case of violations - Rent** - Venderliz (lat.) - Easement - Superficies - Leasing -Privatization (corporate rights of the state >50%) -Reprivatization (corporate rights of the state >50%)	- Mortgage - Easement - Rent - Emphyteusis -Privatization (corporate rights of the state <50%) -Reprivatization (corporate rights of the state <50%)	Rent Sequestration Raiding Venderliz (lat.) -Privatization (corporate rights of the state <50%) -Reprivatization (corporate rights of the state <50%) - Requisition
nO	Vindication	- Emphyteusis - Consignment	- Privatization full - Reprivatization full	Redemption Eviction Realization Requisition Arrest Confiscation Granting Sale Alienation Eviction Restitution Acquisition

Source: own study, based on definitions of various forms of ownership transformations

Some of the presented transformations show macrotransformation in the 'private-state' range of property (privatization, reprivatization, nationalization). Another group of forms of transformation is more related to transformations at the meso-level and micro-level (concession, clustering, merger, acquisition, division, lease, and others). It is also necessary to note such forms of transformation which demonstrate change of the right to use and dispose property (easement, emphyteusis, sequestration, vindication, hire, and others).

Each of these forms finds its place in economic practice. For instance, mergers as a form of transformation are carried out by merging the debtor company with other

financially stable companies. As a result of such a merger, the debtor company loses its independent legal status.

Unlike a merger, an acquisition takes the form of a significant investment by one entity into another. An enterprise that is acquired usually loses its independent status, although as a legal entity, it may be retained as a subsidiary.

Table 3. Forms of Property Transformation for Beneficiary

(non) Ownership, / (non) Use, (non) Disposal	**UD**	**nUD**	**UnD**	**nUnD**
O	- Barter - Redemption - Granting - Purchase - Accession - Privatization (corporate rights of the investor >50%) - Reprivatization (corporate rights of the investor >50%) - Deprivatization - Restitution - Acquisition	- Privatization (corporate rights of the investor >50%) - Reprivatization (corporate rights of the investor >50%) - Deprivatization	- Privatization (corporate rights of the investor and affiliates <10 %) - Reprivatization (corporate rights of the investor and affiliates <10 %) - Deprivatization - Emphyteusis	- Vindication - Privatization (corporate rights of the investor and affiliates <10 %) - Reprivatization (corporate rights of the investor and affiliates <10 %) - Deprivatization - Sequestration
nO	Requisition	- Eviction - Sequestration - Venderliz (lat.) - Confiscation	- Rent - Leasing - Concession - Easement - Superficies - Raiding	Saving Nationalization

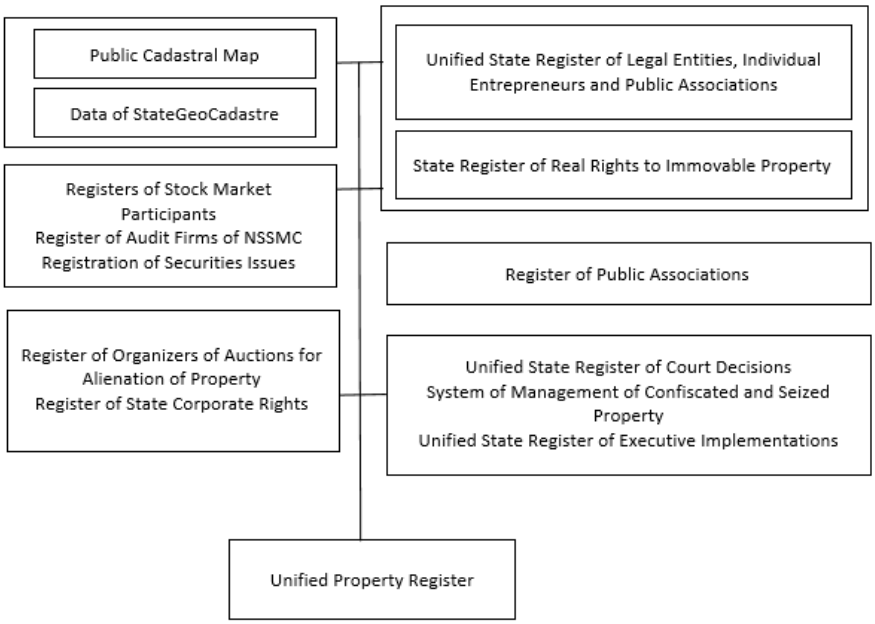
Source: own study, based on definitions of various forms of ownership transformations

For example, emphyteusis provides the right to use someone else's land for agricultural purposes and is an example when the beneficiary does not own it, but uses and does not dispose it. Such and similar transformations often underlie trust management, which is somewhat contradictory for public authorities.

Trust ownership has a number of features, namely the possibility of joint ownership of property by several owners with anonymity, when the ultimate owner of the property remains unknown. It is also possible for the same person to be the founder and beneficiary,

thus receiving all the benefits from the property. However, there are controversial issues regarding trust management, which in the triad of ownership-use-disposal emphasizes the latter. Trust management makes it possible to differentiate between owners, beneficiaries and managers, which make trust relations a convenient mechanism for tax evasion. In some countries, beneficiaries (property users) are not required to report the income of the trust in a state the beneficiaries reside. Moreover, the use of trust management ensures the unavailability of property for creditors, the opportunity to declare the absence or limited amount of their own assets and apply, for example, for assistance from the state. There is a practice of registration of enterprises for other persons (students, pensioners, socially vulnerable groups, persons registered in the territory not controlled by Ukraine). It is necessary to compose an information base of the existing registers, which provide the necessary data for public authorities for evaluation and further planning. The most important are the existing registers, which would be most useful for the creation of the Unified Property Register.

Fig. 1. Formation of Information Sources of the Unified Property Register on the Example of Ukraine



Source: own study, based on existing registers in Ukraine

The formation and use of a common unified property register should naturally bring some positive results. Each of these results of using the proposed tool – a single property

register – has its own explanation. In the case of Ukraine, for the Antimonopoly Regulation, this register would be useful for assessing and monitoring the dynamics of ownership concentration in various sectors of the economy, detecting warning signals of unfriendly takeovers through the matrix approach to property transformation proposed in the Unified Property Register. For the State Property Fund of Ukraine – in assessing the dynamics of financial results of state enterprises and those preparing for privatization, determining the feasibility of rehabilitation of state enterprises. For the State Financial Monitoring Service – the detection of violations that are used to conceal the ultimate beneficial owner. For the Ministry of Economic Development, Trade and Agriculture of Ukraine, the register data would be needed to assess the dynamics of financial results of enterprises with state corporate rights, to identify sectoral disparities. Therefore, we consider the transformation of the property register to be expedient and necessary.

Nontheless, the dialectic of the contradictions of the global monopolization of capital is reduced to the unity and struggle of essentially opposite economic phenomena and processes.

Consequently, nowadays, the policy of deconcentration should be based on the search for effective structures, new transformational formations of optimal size in terms of concentration of production and capital, with ensuring the competitiveness of the country in the context of globalization.

Summary, recommendations

The problems faced by both public authorities and society regarding the imperfect formation and use of property information require a new approach to solving this problem. Digitalization gives us new opportunities for this, which can allow us to accumulate all property information in a single register. Our proposed matrix approach will allow us to track all possible transformations of ownership, taking into account the information on the triad of property rights: ownership, use, disposal.

Of particular interest from the point of view of valuation and state planning of business transformation is the matrix approach in cases of concentration of capital resulting from mergers, acquisitions, mergers and other indirect forms of interaction.

Strengthening the protection of property rights is necessary to restore confidence and promote favorable economic development. A single role in this process belongs to the Unified Property Register [Pozniakova, O., 2020, p.47], which would accumulate information not only on the ownership but also the use and disposal of property, generating information on all previous transformations, which would prevent most raider seizures.

The authors plan to investigate and describe in more detail the matrix approach to the formation of a single register in future studies.

The question also remains whether the introduction of this register will provoke the withdrawal of capital from Ukraine and what preventive measures should be taken to prevent and cause new negative consequences of the proposed transformations. The investigation of the issues of private property and personal data in the context of protection of rights of consumers of financial services is presented in other works, but the topic requires implementation in the context of specific issues and conducting of further research.

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Relationship between education and production value of small and medium family farms in Poland

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Abstract: Scientific reports indicate a very important role of human capital manifesting itself as a significant impact on the gross domestic product. Since agriculture creates a significant part of the gross domestic product, it may be assumed that human capital significantly influences production in this sector of the economy. A significant role in the global agricultural production is played by small and medium family farms, in particular, their important role in maintaining biodiversity and providing traditionally produced food. Taking into account the above dependencies, the aim of the study was to verify the influence of the education of the owners of small and medium farms on the production value. Small and medium family farms in Poland have been analysed. After analysing a variety of definitions, the qualification criteria for this group of farms included the area of the farm (up to 20 ha), the value of standard production (up to 25 thousand EUR), and the share of own labour involved in agriculture (at a minimum level of 75%). The data for analyses were obtained through surveys conducted on a sample of 710 farms from Poland. The surveys were carried out in 2019. The following variables were included in the analysis: farm area, total farm output value per ha and per farm member, and a synthetic measure of human capital. The TOPSIS-CRITIC method was used to determine the synthetic measure of human capital, and the following were included in the said measure: age of the farm manager, participation in continuing education, and education of the farm manager. The analysed farms were divided into two classes according to their education, i.e. one class consisted of farms where the owner had a university degree and the other class consisted of farms where the owner had a secondary or lower secondary education. Contrast analysis was conducted between the determined classes.

The analyses conducted in this study indicate a significant relationship between the farm owner's education and the value of total farm production per ha and per farm member. A more favourable value of total farm production per ha and per farm member was found in farms where the manager had a higher vocational education or master's degree. This difference should not be explained by the farm's production scale and size when compared to the farms of a larger area with University educated farm owners, because the difference in area between the classes of these farms was too small.

Key words: human capital**,** TOPSIS-CRITIC, small farms, farmers' education

JEL: Q00, Q14, E24

Introduction

Human capital is perceived as an important factor influencing the economy, in the scientific literature it is even reported to be responsible for several per cent of GDP growth

[Sardadvar & Vakulenko, 2021; Landau, 1983; Barro, 2001; Arefieva et al., 2021; Dalevska et al., 2019; Kharazishvili et al., 2020; Kwilinski et al., 2020]. It is also an obvious fact that the agricultural sector is involved in the production of GDP and this means that this sector should also be influenced by human capital. However, it should be remembered that in the case of human capital connected with agriculture, we may speak of human capital specific to agriculture, referred to as industry-specific human capital. When considering problems related to human capital in agriculture, it should be kept in mind that this figure is significantly influenced by inherited knowledge, passed on from older generations, most often parents. Moreover, usually young entrants to agriculture, before taking over a farm from an early age, participate in agricultural production processes thus acquiring practical skills for later independent farm management. Taking the above into account, we should remember the special role related to the processes of capital inheritance in farms and the creation of particuler, industry-specific human capital.

In view of the above premises, the aim of the study was to verify the influence of the education of owners of small and medium farms on the production value.

Literature review

According to Adam Smith, human capital is considered to be a generalized characteristic of the quality and capacity of human labour, thus constituting a major source of income and factors promoting labour productivity growth [Smith, [1776] 1998].

The definition given by Smith has already been modified many times and contemporary human capital is understood as a resource of knowledge, skills, abilities (including creativity and mental abilities), human impulses for productive work acquired through education, training or based on practical experience, and having high economic significance [Juliya, 2015; Abazov, 2021; Dementyev & Kwilinski, 2020; Dzwigol et al., 2020].

The human capital theory views investment in health policy and health care as critical elements of human capital building. The health insurance system plays an important role in the context of maintaining adequate levels of health care [Inwood, 2017; Trushkina et al., 2020; Yelnikova & Kwilinski, 2020].

Nowadays, mainly due to the dynamic development of new technologies, human capital is seen as a key source of the strongest competitive advantage of companies. Today,

success no longer depends on improving productivity, but on human capabilities derived from human capital. In view of the above, one of the main aspects of human capital creation becomes ensuring the availability of a continuous training process, which ultimately leads to prolonged professional activity and increased competitiveness of organizations [Kogovsek & Kogovsek, 2013; Bogachov et al., 2020; Dzwigol et al., 2020; Kuzior et al., 2019].

The availability of high-quality food affects the shaping of human capital - such thinking justifies the impact of low-quality food products on human health, fitness and the intellectual development of the younger generation [Gorbunova et al., 2015]. There are known studies that show a correlation between environmental care and farmers' education [Chen et al., 2021].

Studies conducted in Bulgarian and Hungarian farms focused on crop production or dairy production have shown the relationship of human capital between age and education [Mathijs & Vranken, 2001].

In turn, German studies show that farms with higher income capacity are more willing to invest in agriculture-specific human capital. Furthermore, empirical analyses conducted within the cited studies indicate positive rates of return from farmer education. However, there is a correlation indicating lower returns from farmer education than from other professions [Bartels, 1996].

Some studies indicate age as a key factor in the human capital model [Barry et al., 2020].

Studies conducted in the UK led to the conclusion that development-oriented human resource management strategies put older employees at risk, in relation to younger employees. However, some high-performance work practices show that older employees achieve greater benefits in relation to younger employees. However, a limitation in the organisation of production processes may be the over-representation of older employees who have adopted fixed positions related to the evaluation of their activities satisfactory to themselves [Haile, 2021].

The neoclassical approach to human capital indicates that individual employee characteristics, such as age and education, increase learning efficiency and are decisive in directing employees to train [Barry et al., 2020].

Observations related to a business' decision-making indicate that age, rather than education, is the key factor in deciding whether to send an employee for training [Barry et al., 2020].

Surveys conducted in Poland on farm efficiency show that the farmer's education and socio-demographic factors play a key role in this respect. Along with an improvement in education, the attention is mainly paid to higher education, farmers' awareness of the use of subsidy schemes, debt, and innovative solutions is increasing. Moreover, there is also an increasing interest in precise farming, which directly translates into better technological and financial efficiency of farms [Pastusiak et al., 2021].

Studies conducted in the USA indicate that the farmer's education has a significant impact on the productivity of modern agriculture. In addition, analysis of historical data also indicates that the network of common schools had a positive impact on the application of innovation in agriculture [Parman, 2012].

Research methodology

Small and medium family farms from Poland were analysed. Analysing a variety of definitions, as qualification criteria for this group of farms, the area of the farm up to 20 ha, the value of standard production up to 25 thousand EUR, and the share of own labour involved in agriculture at a minimum level of 75% were adopted.

The data for analyses were obtained through surveys conducted on a sample of 710 farms from Poland. The surveys were carried out in 2019.

Farms for analysis were divided into two classes according to education. Class A consisted of farms where the owner did not have any education or had the following education: primary, junior high school, general secondary, secondary vocational, or post-secondary. Class B comprised farms where the owner had higher vocational education or a master's degree.

Data were collected through face-to-face interviews by farm advisors or specialised companies. The interview had a structured questionnaire containing four thematic blocks of questions: socio-economic sustainability, environmental sustainability, market linkages, and general farm characteristics. To ensure correct data collection, the main studies were preceded by pilot studies. The pilot studies included several interviews in selected farms in

order to check the correctness and clarity of the questions included in the questionnaire. As a result of the pilot studies, incomprehensible questions were removed or corrected, and appropriate comments were added to other questions.

The value of total farm production per ha was used in the analyses, additionally, this value was converted per farm member. The second variable used in the analyses was the area of the farm. In addition, a variable describing the human capital of the farm was used, with this variable consisting of three values: age of the farm manager, education, and participation in continuing education. The synthetic variable of human capital was developed according to the procedure described below.

The variables used for the synthetic measure of human capital, in the case of stimulants, were subjected to zero unitarisation according to formula (1), while in the case of destimulants, the following formula was applied (2).

$$stimulant: z_{ij} = \frac{x_{ij} - min_i\{x_{ij}\}}{max_i\{x_{ij}\} - min_i\{x_{ij}\}}, (i = 1,2, \dots, n; j = 1,2, \dots, k; from \in [0,1] (1)$$

where:

$min_i\{x_{ij}\}$ – minimum value of function j,

$max_i\{x_{ik}\}$ – maximum value of function j,

i – object (in the analysed case the farm).

$$destimulant: z_{ij} = \frac{max_i\{x_{ij}\} - x_{ij}}{max_i\{x_{ij}\} - min_i\{x_{ij}\}}, (i = 1,2, \dots, n; j = 1,2, \dots, k; from \in [0,1] (2)$$

where:

$min_i\{x_{ij}\}$ – minimum value of function j,

$max_i\{x_{ik}\}$ – maximum value of function j,

i – object (in the analysed case the farm).

Subsequently, weights for the selected variables were determined using the TOPSIS-CRITIC method (designation of criteria through the correlation between criteria). In the TOPSIS-CRITIC method, weights are determined on the basis of standard deviations and correlations between variables. A characteristic feature of this method is that relatively higher weights are assigned to characteristics that have a high coefficient of variation but low correlation with other characteristics [Borychowski et al., 2020]. The weights of the variables were determined according to the following formulas:

$$w_j = \frac{c_j}{\sum_{k=1}^{m} c_k}, j = 1,2, \dots, m; c_j = s_{j(z)} \sum_{k=1}^{m} \left(1 - r_{ij}\right), j = 1,2, \dots, m \ (3)$$

where:

c_j – a measure of the information capacity of characteristic *j*,

$s_{j(z)}$ – standard deviation calculated based on the normalised values of the characteristic *j*,

r_{ij} – correlation coefficient between characteristics *j* and *k*.

The next step was to multiply the established normalised values of the variables by the appropriate weighting factors. Using the values of the variables after the weighting process, the Euclidean distances of the individual units from the development pattern and anti-pattern were calculated according to the following formulas (4) and (5):

$$d_i^+ = \sqrt{\sum_{j=1}^{k} (z_{ij}^* - z_{ij}^+)^2} - distance\ from\ the\ development\ pattern\ (4)$$

$$d_i^- = \sqrt{\sum_{j=1}^{k} (z_{ij}^* - z_{ij}^-)^2} - distance\ from\ the\ development\ anti-pattern\ (5)$$

where:

$$z_j^+ = (max(z_{i1}^*), max(z_{i2}^*), \dots, max(z_{ik}^*)) = (z_1^+, z_2^+, \dots z_i^+)$$

$$z_j^- = (min(z_{i1}^*), min(z_{i2}^*), \dots, min(z_{ik}^*)) = (z_1^-, z_2^-, \dots z_i^-)$$

In the next step, the value of the synthetic characteristic q_1 is determined according to the following formula (6):

$$q_i = \frac{d_i^-}{d_i^+ + d_i^-}, (i = 1,2, \dots, n) (6)$$

Table 1 presents the list of variables used in the TOPSIS-CRITIC analysis and the weights of the individual elements.

Table 1. List of variables used to create the synthetic measure of Human Capital

Name of the synthetic measure	Name of the variable	Type of the variable (stimulant/destimulant)	Weight
Human Capital	Age of the farm's manager	Destimulant	0.825
	Education of the farm's manager	Stimulant	0.070
	Participation in the continuing education	Stimulant	0.105

Source: own elaboration based on the conducted analyses

It is generally assumed that work experience increases with length of service, however, when considering this aspect, it is necessary to take into account the nature of the work performed. If the work performed consists mainly of simple physical activities, assuming that the employee's physical fitness deteriorates with age, we come to the conclusion that human capital decreases. It would be more appropriate to say that it is not the definitional human capital that decreases but the physical fitness. Following the aforementioned dilemma, it was decided to treat the employee's age as a destimulant. Treating age as a distimulant in human capital measurement is also supported by general health conditions, which deteriorates systematically with the age of the employee.

Analysis of the results

As a result of the process of determining the weights carried out with the TOPSIS-CRITIC method, we can see that the greatest importance in the synthetic measure of human capital was assigned to the variable: age of the farm manager (weight 0.825). Then, the next weight was assigned to the variable: participation in continuous education (weight 0.105). The lowest weight in the human capital measure was assigned to the variable: education of the farm manager (weight 0.070). The recognition of age as an important factor in the measurement of human capital is also confirmed by other scientific studies. Furthermore, it is indicated that age, rather than education, is the main factor determining whether employees are sent for training [Barry et al., 2020]. The relationships obtained in the present analyses are confirmed by the cited scientific reports (Table 1).

Farms grouped according to the education class of the owner of the farm indicate a more favourable material situation in farms where the owner has a higher vocational education or a master's degree (class B). In this class of farms, we can observe a higher value

of farm production in total per ha and per farm member, the difference in the discussed case being about PLN 400. It should also be noted that in class B (farmers with higher education), we can observe a larger area of farm by more than 2 ha (2.41 ha), but this difference does not seem to justify such a large difference in the scale of production to explain the higher value of production of a farm in total (Table 2).

Table 2. Characteristics of farms grouped by education class *

Class	N	Area of the farm (ha)	Total value of production from the farm per ha and per farm member (PLN)	Synthetic measure of human capital
A	601	13.73	1940.19	0.389232
B	109	16.14	2368.94	0.538297
Total / Average	710	14.10	2006.01	0.412117

**Class A: no education, education: primary, vocational, general secondary, vocational secondary, post-secondary;*

class B: first-degree education (bachelor's degree, engineer's degree) and second-degree education (master's degree)

Source: own elaboration based on the analysed data

There was also a difference in the synthetic measure of human capital in favour of class B (0.149065) (Table 2). However, the interpretation of this difference should be approached very cautiously because it also includes education, which was the criterion for dividing the surveyed farms into analytical classes.

It is generally acknowledged that a systematic increase in education should result in a systematic increase in farm productivity. In the conducted studies, a significant difference was found only between university education and the other levels of education. This may indicate a decrease in the quality of education in recent years, as we are currently observing an increase in the universality of education in recent years (more young people have an education). In view of the above, two important components of human capital, age, and the level of education, function simultaneously in this situation.

Table 3: Evaluation of contrasts

Name of the variable	N	Class by education	SS_{effect}	Contrast (1;1)
Area of the farm (ha)	601	A	538	0.90
	109	B		
Value of production from the farm in total per ha and per farm member (PLN)	601	A	16960889	0.60
	109	B		
Synthetic measure of Human Capital	601	A	2	0.23
	109	B		

Source: own elaboration based on the analysed data

The performed analysis of contrasts indicates that a change in the area of a farm from class A to B explains about 90% of the difference between the level of education in the analysed classes (Table 3). On the other hand, the difference between class A and B determined on the basis of the level of education explains about 60% of the difference in the value of production from a farm in total. The same difference between classes A and B explains only 23% of the difference in the synthetic measure of human capital, but at this point, it should be noted that this measure also includes information about the level of education of the owners of the farm.

Conclusion

The analyses conducted in this study indicate a significant relationship between the farm owner's education and the value of total farm production per ha and per farm member. A more favourable value of total farm production per ha and per farm member was found in farms where the manager had a higher vocational education or a master's degree. This difference should not be explained by the farm’s production scale and size when compared to the farms of a larger area with University educated farm owners, because the difference in area between the classes of these farms is too small.

What is surprising is the lack of significant differences between the lower levels of education of farm owners, especially between secondary and other levels of education. This may indicate a significant decline in the quality of education in recent years. This suggestion, however, certainly requires further research targeted at the level of farmers'

education and the value of farm production measures obtained by them. Such studies should include bigger research samples and very precisely capture the regional variation.

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Appendix A Tests of significance

Effect	Multivariate Tests of Significance; Sigma-restricted parameterization; Effective hypothesis decomposition					
	Test	Value	F	Effect df	Error df	p
Intercept	Wilks	0.199299	945.4701	3	706	0.000000
	Pillai's	0.800701	945.4701	3	706	0.000000
	Hotellng	4.017578	945.4701	3	706	0.000000
	Roy's	4.017578	945.4701	3	706	0.000000
Class - Farm owner's education	Wilks	0.939960	15.0318	3	706	0.000000
	Pillai's	0.060040	15.0318	3	706	0.000000
	Hotellng	0.063875	15.0318	3	706	0.000000
	Roy's	0.063875	15.0318	3	706	0.000000

Appendix B Tukey's HSD Test

Dependent variables - value of total farm production per ha and per farm member		
Approximate Probabilities for Post Hoc Tests Error: Between MS = 9155E3, df = 708.00		
Class - education level of the farm owner	A	B
A		0.173492
B	0.173492	

Dependent variables - synthetic measure of human capital		
Approximate Probabilities for Post Hoc Tests Error: Between MS = ,05464, df = 708,00		
Class - education level of the farm owner	A	B
A		0.000009
B	0.000009	

Dependent variables - area of the farm		
Approximate Probabilities for Post Hoc Tests Error: Between MS = 63.794, df = 708.00		
Class - education level of the farm owner	A	B
A		0.003698
B	0.003698	

Safety Management of Environmental Protection and Preservation and Sustainable Development of the Local Community

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Abstract: Many security risks lurk in the modern world, including security risks in the field of environmental protection and preservation. Ensuring the quality of the environment means maintaining the local and planetary biosphere as an essential support system for the realization of all human activities, and above all, the concept of sustainable development of the local community. Therefore, a systematic approach to safety management in the field of environmental protection and preservation must be provided. As a result, an adequate local community security strategy should be developed at the local level.

Key words: Sustainable development, local community, modern security risks, security strategy, environmental protection and preservation, environmental quality

JEL: Q01

Introduction

Environmental security as the absence of threats, damage to the natural environment and population health has no limits and is a global challenge. Therefore, it must be taken care of by the United Nations (UN), with the obligatory cooperation of national security entities. Special attention should be paid to the prevention of possible accidents in the field of environmental safety. Addressing a number of environmental security challenges is highly dependent on the economic power of individual states.

Ecological safety according to Vranješ [Vranješ N., 2009] includes: 1. a complex of conditions, phenomena and actions that provide ecological balance on the Earth at the local, regional and global level; 2. exclusion of any human activity that has a harmful effect on the environment; and 3. a situation in which there is no danger of causing damage to the natural environment and the health of the population.

The modern world is aware that environmental safety[22] depends not only on humans and their activities, but also on natural disasters (earthquakes, floods, volcanic landslides, hurricane winds, etc.). The main carriers of environmental threats are people, i.e. their actions or inaction.

This paper will look in detail at previous research and security challenges at the global, regional and national levels. Also, a strategic-doctrinal and systemic approach in solving the preservation of society and environmental safety will be proposed, with special reference to the security strategy of the local community as a cell of the world. Without that, there is no realization of the concept of sustainable development.

Environmental safety as a product of the work of a number of researchers

The modern world is well aware that national security has the state as the main reference, while human safety has the human or human species as references. Lothar Brock, a researcher at the Frankfurt Institute for Peace Research, asks: "What is the reference of environmental security - safety or the environment, conflicts over natural resources or environmental quality of life?" To answer his question, it is necessary to connect the academic community and the community that deals with the creation of security policy. Security policy makers focus on new, non-military security challenges, while environmental policy makers use foreign experiences and security policy arguments to point to the urgency of solving environmental problems, especially those at the global level [Carius & Imbusch, 1998: 8].

The term Environmental Security[23] is associated with a number of researchers in this field [Ullman, 1983; Mathews, 1989; Myers, 1993; Westing, 1989; Buzan et al., 1998]. Environmental safety has gone through three stages of development since the 1970s [Rønnefeldt, 1997; Brauch, 2003] and is now in the fourth phase of synthesis and reconsideration of the notion of security [Dalby, 2002: 96]. This phase is characterized by the ENVSEC (Environmental security) initiative, which is aimed at: 1. vulnerability assessment and

[22]Katrina Rogers distinguishes the notion of *environmental security* from *ecological security* [Rogers, 1997: 503–509]. *Environmental security* is used in terms of protection and defense of natural resources and describes the threat to political stability due to environmental problems.

[23]Encyclopaedia Britannica defines the environment as a set of physical, chemical and biotic factors that have an effect on an organism or ecological community and essentially determine its shape and survival. Ecology refers to "the study of the relationship between organisms and their environment."

environmental monitoring and security connectivity; 2. policy development and implementation; and 3. institutional development, capacity development and protection. The ultimate goal of the fourth phase of research on human and environmental security and peace is to persuade politicians to recognize and point out the causes of fatal outcomes of environmental degradation, and prevent serious crises, which can even lead to war conflicts, etc. Specific strategies that would be initiated must vary from case to case and must include specific context, history, and propensity for conflict [Brauch, 2003; 2005]. The World Federation of UN Associations (WFUNA) also addressed this issue, defining environmental security[24] as "the ability of the environment to provide support for life", and consists of three sub-elements: a) prevention or recovery from environmental damage during military actions; b) prevention or response to environmental conflicts; and c) protection of the environment due to its inseparable moral values [WFUNA, 2008].

World peace sometimes depends on the environment. In his research, Brock [Brock, 1991: 408] identified the following links between peace and the environment: a) environmental impoverishment leads to far-reaching social conflict and war; b) modification of the environment as an instrument in inter-social relations; c) environmental impoverishment as a specific cause of violence; d) trust and confidence on which ecological cooperation is built; d) use of military means for the implementation of environmental standards; and f) a healthy environment as an integral part of comprehensive security.

Dyer [Dyer, 2002: 67–81] believes that environmental security should “take into account the spatial and temporal dimension (universal and intergenerational) of environmental change”. Matthew [1997: 89] sees environmental security as “a component of a more general approach to the theory and practice of world politics that underscores the importance of the way in which social and ecological systems influence each other. At the same time, environmental security is capable of standing on its own as a link between environmental and community security experts.” Jon Barnett [2001: 129] argues: “environmental security is a process that reduces environmental insecurity to its minimum”, setting people as the main reference of safety. Environmental security requires that states

[24]In 1995, in the US National Security Strategy, the United States stated: "Protecting our national security - our people, our territory and our way of life - is a priority of the government and a constitutional obligation… A wide range of environmental degradation threatens political stability in many regions and countries." [Woodrow Wilson Report, 1995: 47].

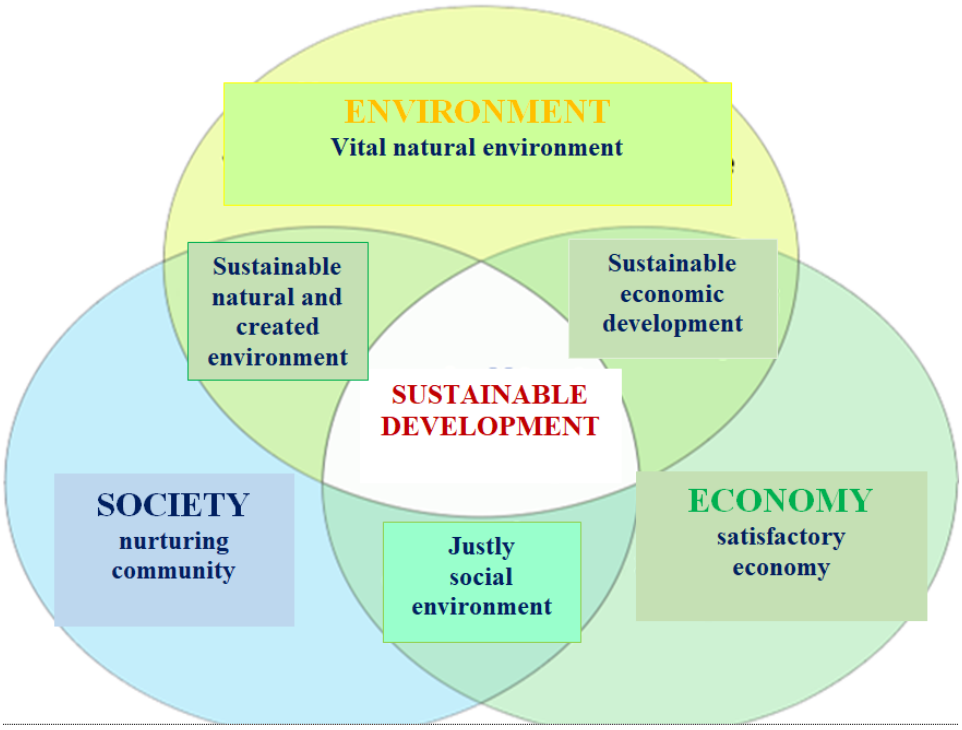
"act internally and curb global, regional and local processes that lead to environmental degradation and human insecurity."

As the quality of life does not exist without its constant improvement, which implies constant ecological safety and environmental protection, a new concept was introduced in the 1980s - sustainable development.

The concept of sustainable development - a paradigm of overall development

The concept of sustainable development corresponds in time to environmental safety and environmental protection. With *the Bergen Declaration*, the ministers of European countries in 1990 better defined the term: sustainable development. This concept was subsequently accepted by the international community and is based on the triangle: **ecological balance, economic security and social justice** (Fig 1). Some experts had a different view, so they defined that sustainable development lies on "4 pillars". Every concept takes great care of environmental safety and environmental protection.

Figure 1. The concept of sustainable development



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The importance of sustainable development can best be seen in the statement by Rajendra K. Pachauri, director of the TATA Energy and Resources Institute (TERI) in New Delhi,

who defined environmental safety as "minimizing environmental damage and promoting sustainable development, with emphasis on cross-border dimensions… Economic vulnerability and resource dependence play a key role in relation to environmental change and the potential for violence and insecurity in developing countries." Pachauri also points to the link between poverty and degradation of natural resources:

"First, the constant struggle to provide food and meet basic needs increases land degradation in developing countries… Second, worsening pollution affects air quality, along with traffic and industrial expansion… Third, global climate change is leading to rising temperatures and sea levels, as well as dire consequences when it comes to the coasts of South Asia… Fourth, water quality and quantity are endangered due to land use, deforestation and water pollution, both at the local level and across national borders"; according to: [Brauch, 2003: 69].

The complexity of the present moment has led to the existence of numerous experts and practitioners dealing with the phenomenon of sustainable development. In this, they are helped by the identification of areas and indicators of sustainable development that the EU has determined in its Sustainable Development Strategy (Table 1).

It is evident there is no sustainable development without ecological security.

Ecological security and preservation of the environment - preconditions for sustainable development

Ecological security means creating conditions in which the physical environment of the community enables the satisfaction of the needs of the population without reducing the natural reserves [Rogers, 1997: 503–509]. Dennis Pirages and Ken Cousins define environmental security as maintaining four dynamic balances: a) between people living at high levels of consumption and the ability of nature to provide resources and the supply; b) between the human population and pathogenic microorganisms; c) between humans and animal and plant species; and g) in the human population [Pirages & Cousins, 2005]. The notion of environmental security defined like this clearly separates it from the notion of ecological security[25], as a threat of ecological degradation to political stability.

[25] The difference between ecological and environmental security is shown by the example: If a state invades another state to appropriate additional natural resources or to protect, defend or ensure permanent access to resources, in that case it strives for the security of its environment.

Buzan et al. [Buzan et al., 1990] argue that: "Environmental security is concerned with maintaining the local and global biosphere as an essential support system, on which all human activities depend." Buzan [Buzan et al., 1998: 74–75] includes the following topics in the scientific scope of the environment: 1. *destruction of ecosystems*; 2. *energy problems*; 3. *population problems*; 4. *food problems*; 5. *economic problems*; and 6. *civil unrest***.**

Table 1. Areas, basic and operationalized indicators of sustainable development

AREA	BASIC INDICATORS	OPERATIONALIZED INDICATORS
Socio-economic development	Real GDP per capita	**Economic development** **Innovations, competitiveness and ecological efficiency** **Employment**
Sustainable consumption and production	Resource productivity	**Used resources and waste** **Consumption patterns** **Production patterns**
Social involvement	People at risk of poverty or social exclusion	**Material poverty and living conditions** **Availability of the labor market** **Education**
Demographic changes	Employment rate of older workers	**Demographics** **Adequate income in old age** **Sustainability of public finances**
Public health	Number of healthy life years by gender and life expectancy at birth	**Health and health inequalities** **Determinants of health**
Climate changes and energy	Greenhouse gas emissions Primary energy consumption	**Climate changes** **Energy**
Sustainable transport	Energy consumption for transport in relation to GDP	**Transport and mobility** **Impacts of transport**
Natural resources	Common bird index	**Biodiversity** **Freshwater resources** **Marine ecosystems** **Land use**
Global cooperation	Share of official development assistance in gross national income	**Market globalization** **Financing sustainable development** **Global resource management**
Proper management		**Political coherence and efficiency** **Openness and participation** **Economic instruments**

According to Gaćeša (Gaćeša, D., 2008), ecological security is the protection of citizens from:

- irresponsible pollution of air, soil, flora and fauna;
- irresponsible use of natural resources (water, ore, minerals, fish and hunting stock, gravel, sand, etc.);

- inefficient law enforcement institutions
- and people themselves in their behavior towards nature and the environment.

Environmental security can be compromised directly or indirectly. Man can intentionally or unintentionally endanger environmental safety. The threat itself can be short-term or long-term, and consequently the consequences of the threat. The complexity of the issue of environmental security has led the EU in 2014 to identify areas and indicators of environmental security (EEA Indicators, Luxembourg) (Table 2). It is obvious that the environmental safety indicators defined in this way occupy a significant place in the extended concept of safety (Table 3).

Table 2. Ecological security indicators

AREA	**INDICATORS**
A: Air pollution, transport and noise	
Air pollution	Emissions of major air pollutants
	Exceeding the air quality limit value in urban areas
	Exposure of ecosystems to acidification, eutrophication and ozone
Transport	Demand for passenger and freight traffic
	Use of cleaner and alternative fuels
Industry	Polluting waste from industrial facilities released into the air, soil and water
Noise	Population exposed to noise exceeding the limit values (for road traffic)
B: Climate changes and energy	
Climate change mitigation	EU and national overall gas emission trends greenhouses and projections
	Concentration of atmospheric gases with a greenhouse effect
	Production, consumption and emissions of fluorinated gases
Climate change influence	Global and European temperatures
	Melting trends of European glaciers and sea ice
Energy	An overview of the European energy system
	The share of renewable energy sources in final energy consumption
C: Freshwater resources	
Water resources / water scarcity and drought	Use of fresh water resources
Freshwater ecosystems	Trends and ecological status
Water pollution and quality	Oxygen-consuming substances in rivers
	Nutrients in fresh water
Water and health	Bathing water quality
Impact of climate change on water	Impact of climate change on water
Pressure on water resources	Pressure on water resources

D: Marinas and the maritime world	
Transitional, coastal and marine water quality	Nutrients in transitional, coastal and marine waters
	Chlorophyll in transitional, coastal and marine waters
	Hazardous substances in marine organisms
Fishing	Marine fish stock status
	The quality of the fishing fleet
Climate changes	Sea surface temperature
	Global and European sea level rise
E: Biodiversity and ecosystems	
Status and trends of biodiversity components	Species and habitats of European importance
	Protected areas
	Abundance and distribution of selected species
Biodiversity threats: habitat loss and degradation	Loss of land
	Habitat and ecosystem fragmentation
Agriculture and forestry sectors	Agricultural land under Natura 2000
	Forests: wood stocks, increments and dead forests
F: Waste and resources	
Waste production	Waste production
Waste recycling	Waste recycling
Landfill diversion / disposal	Diversion of waste from the landfill
Household consumption	Intensity of household pressure on the environment
Energetic efficiency	Intensity of total primary energy
Separation of environmental pressures	Separating resource use from environmental pressures
Separation of environmental impacts	Separating the use of resources from the impact on the environment

The environment is the foundation of the life of all living beings, animals and plants and is an important factor of internal stability and national security. Environmental degradation also affects the internal security of a country. The causes of its endangerment can be:

- *social,* as predominant and the result of human actions as dominant factors of protection and endangerment of the environment*,* and
- *natural.*

Endangerment of the environment can be:

a) “Endangerment by radiological-chemical, physical (noise, vibrations, particles, etc.) and biological agents, with numerous modifications of sources and forms of endangerment originating from peacetime or war conditions. This way of endangerment is primarily related to its artificial origin, as a product of

scientific, technical and technological progress in the field of civilian and military technologies.

b) Endangerment with geophysical weapons to change weather and climate, seas and oceans, causing earthquakes and storms and manipulating electromagnetic radiation reaching the earth, often referred to in the literature as "weapons for changing the human environment", "environmental weapons", etc. These are intentional geophysical modifications that are applied in peace and war in order to undermine the security of a certain country. It is based on the fact that in some regions of the world a larger amount of natural energy is accumulated than usual, and that it is possible to cause its instability if it is identified and triggered by lower energy potential (Bhupenr, 1976: 157 cit. According to Keković, Todorović, 2008: 26). Therefore, it is possible to artificially cause earthquakes, high waves, disturbance of the ecological balance of a landscape, changes in the precipitation regime, etc." (source: Matijašević-Obradović DJ & Obradović MA, 2014).

Table 3. Position of environmental security in the extended concept of safety

Dimensions (sectors) of security Levels of interaction	**Security – for whom and what**	**Security – for which values**	**Security – from what threats**
National (political) and military dimension	State	Territorial integrity, organizational stability, sovereignty	Other countries, guerrillas, terrorism (substate actors)
Social	Nation, social groups	National unity, identity	States (nations), migrants, acculturation
Human	Individuals, human race	Survival, the quality of life	State, globalization, nature, terrorism
Ecological	Ecosystems, biosphere	Sustainability of society and the state of the environment	Human race
Gender	Gender relations		Totalitarian institutions, intolerances

Source: Autori koristeći: Møller, 2000; Oswald, 2001; Brauch, 2008

Ecological safety and preservation of the environment are very important for the realization of sustainable development of Serbia. Serbia, as a part of Europe and the Planet, must be a part of the global systemic approach to the Management of Security and Environmental Protection. It must take on the obligations arising from UN and EU documents. In particular, it must develop a systemic approach to national security, an important element of what will be environmental security. Local governments (cities and municipalities) must develop their own environmental safety strategies.

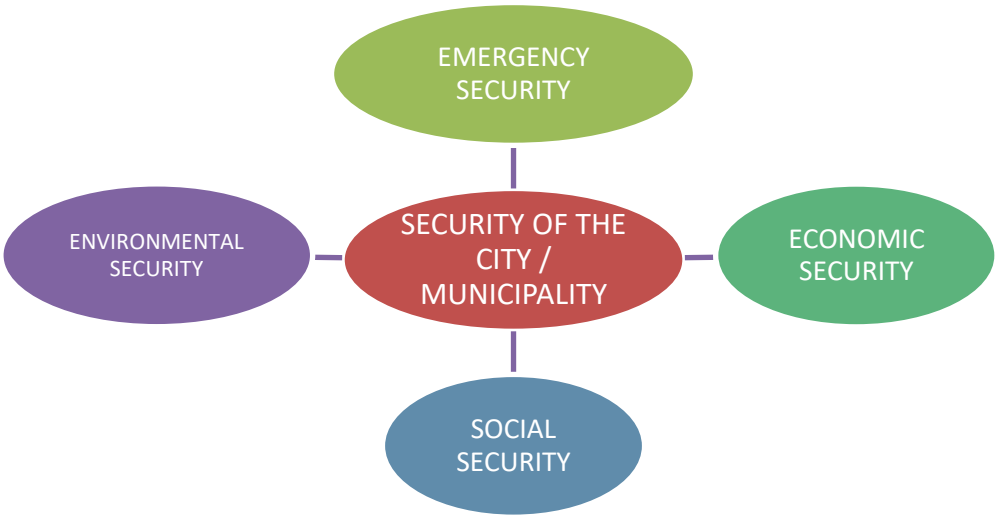
Possible model of security strategy of cities / municipalities with special emphasis on environmental safety

The security strategy of a local community (city or municipality) can be a significant management tool for its leadership. The process of preparing the Security Strategy of cities / municipalities should have:

a) Integral and participatory approach,
b) Cross-sectoral cooperation and information exchange, and
c) Involvement of the public, private and civil sectors.

The security strategy at the local level should define the overall security of the city / municipality. It consists of four security components: *1. Economic security, 2. Social security, 3. Environmental security and 4. Emergency Security (Fig. 2).*

Figure 2. Local community security components - city / municipality



Source: own work

Table 4 shows the general and specific goals of the security components of the local community - city / municipality. Meeting the goals will ensure prevention and prevent inconsistencies in the overall development of the local community. This means that sustainable development can be achieved in a planned way without any negative surprises.

Table 4. General and specific objectives of the security components of the local community - city / municipality

	General objective	**Specific objectives**
1. ECONOMIC SECURITY	Increasing the standard of living by creating a favorable business environment, increasing employment, improving the image of the city / municipality and increasing the level of safety at work.	1. Creating a favorable business environment of the city or municipality.
		2. Increasing employment.
		3. Improving the image of the city / municipality.
		4. Increasing the level of safety at work, in the private sector and urban transport.
2. SOCIAL SECURITY	Creating favorable conditions for improving the security of individuals and social groups in the city / municipality through meeting the needs of citizens, protecting their rights, systemic improvement of education, health and social policy, family protection and personal safety.	1. Raising the level of security culture.
		2. Strengthening the mechanism for more efficient work of local self-government, especially in the field of security.
		3. Raising the level of health safety and public awareness and health risk factors.
		4. Raising the level of security in educational institutions.
		5. Poverty reduction and greater care for marginalized social groups.
		6. Strengthening the mechanism for prevention and fight against all forms of crime.
3. ECOLOGICAL SECURITY	Improving the quality of the environment in accordance with the principles of sustainable development.	1. Improving the environmental system and monitoring changes in the environment and informing the public.
		2. Establishment of an integrated waste management system and remediation of landfills.
		3. Establishment of a system of protection, preservation and sustainable use of land, natural resources and biological diversity.
		4. Preservation and sustainable use of water sources, water supply systems and protection of watercourses.
		5. Improving the heating and gasification system, application of energy efficiency principles and use of alternative energy sources.
	Construction of a unique Emergency Management	1. Construction of an integrated emergency management system.

4. SECURITY IN EMERGENCY SITUATIONS	System that contributes to increasing security and reducing the risk of technical-technological, natural and anthropological impacts.	2. Construction of a unique information-communication system for emergency management.
		3. Creating conditions for more effective functioning of the protection and rescue system at the level of the city / municipality.
		4. Improving emergency prevention.
		5. Improving education, training and information.

Source: adapted to the Security Strategy of the City of Nis

The environmental safety system includes a set of legislative, technical, medical and biological measures aimed at maintaining a balance between the biosphere and anthropogenic impacts. The subjects of environmental security are individuals, society, the biosphere and the state. Objects are the vital interests of the subjects of security, law, material and spiritual values, natural resources and the natural environment as the material basis of state and social development.

The area of environmental safety should be observed through the following sub-areas: Atmosphere, Land, Water, Bio-diversity, and Waste. Each sub-area has its own environmental safety indicators, which are systematized in Table 5.

Table 5. Environmental safety indicators

Subareas	**Indicators**
Atmposhere	Concentration of pollutants in the air
	Number of days in the year with exceeded immission of pollutants
	Number of inhabitants connected to district heating
	Percentage of gasification achieved
	Noise level
	Radiation level
Land	Arable land and land under permanent crops
	Percentage of arable land affected by erosion
	Flooded land
	Areas under forests
	Deforestation intensity
	Damage from forest fires
	Urbanized and non-urbanized areas
Water	Availability of controlled drinking water
	The length of the constructed water supply network
	Microbiological safety of drinking water
	Length of the constructed sewerage network
	Amount of treated wastewater
	Surface water quality
Biodiversity	Green urban areas
	Protected areas
	Endangered plant species

	Protected plant species
	Endangered animal species
	Protected animal species
Waste	Amount of waste per household
	The amount of municipal waste that is collected in an organized manner
	Hazardous waste
	Landfill condition
	The amount of recycled waste

Source: adjusted according to the Nis City Security Strategy

By quantifying each indicator of environmental safety at the local community level, significant information is obtained, which local community management can use to make timely and quality decisions related to the environmental safety of the local community. Also, according to the same principle, economic, social and security in emergency situations indicators should be identified and quantified. Thus, a systematic approach can successfully manage the security of the city / municipality.

Conclusion

Environmental security as the absence of threats, damage to the natural environment and population health has no limits and is a global problem. It must be taken care of by the United Nations - the UN, the European Union and the entire developed world, with the obligatory cooperation of national security entities. Only joint efforts can solve the many environmental security challenges we are faced with.

Every country in the world has recognized security in the field of protection and preservation of the environment as a very important factor in its security. Every country is aware that environmental safety does not depend only on man and his activities, but also on natural disasters, but that the main carriers of endangering the environment are people, i.e. their actions or inactions.

Previous research and security challenges at the global, regional and national levels have been examined in detail. Special attention is paid to the local community and its security within the Sustainable Development System.

A Local Community Safety Management Model has been proposed, which includes four sub-areas: Economic Security, Social Security, Environmental Security and Emergency Security.

The sub-area Environmental Security has been elaborated in detail, for which all indicators necessary for quality safety management in the protection and preservation of the environment at the local community level have been identified. According to the same principle, indicators for other sub-areas of city / municipality security should be identified and quantified.

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Assessment of the impact of the COVID-19 pandemic on the hospitality industry in Poland. Theoretical and empirical approach

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Abstract: The global COVID-19 pandemic has significantly affected the economy, including the functioning of the hospitality industry. The aim of the article is to analyse the impact of the SARS-CoV-2 virus pandemic on the functioning of Polish hotels, as well as to identify solutions used in the hospitality industry as part of reducing its negative effects. Through quantitative and qualitative research, the current situation of the hospitality industry in Poland was analysed and a survey was carried out among categorized hotel facilities using the CAWI method. The authors of the article collected and analysed selected solutions in the hospitality industry in the light of COVID-19. The results of the survey were also thoroughly analysed. The survey included issues related to the sanitary safety of facilities, the financial aspect of functioning in the legal restrictions caused by the pandemic, the effects of the pandemic on individual areas of hotel operations, or the assessment of the effectiveness of assistance offered to the hospitality industry by the state as part of anti-crisis shields. The obtained results confirmed the extremely difficult situation of hotels in Poland, insufficient state aid and difficulties that the hotels will face in the near future.

Key words: hospitality, COVID-19, CAWI

JEL: L83, I18

Introduction

The functioning of the hospitality industry in Poland and in the world is subject to many external (usually independent from entities) and internal (dependent on the entity's decision) market factors. One of the external phenomena that have a direct impact on the functioning of the market and the entities operating in it are pandemics. Since 2019, the whole world has been affected by the COVID-19 pandemic, which has also a direct effect on the hospitality industry. In Poland, the course of the pandemic in the hospitality industry can be described by looking at the scope of the applicable restrictions regulating its activities. The article focuses on hotel entities in Poland that are struggling with the effects of the COVID-19 pandemic. Through quantitative and qualitative considerations, the current situation of the hospitality

industry in Poland was analysed and a survey was carried out among categorized hotel facilities using the CAWI method. An important aspect is the conducted scientific discussion in the field of dynamic and unpredictable market changes determined by the pandemic, and conclusions regarding the future situation of the industry.

Literature review

COVID-19 in global and national literature on the subject

The hospitality industry, in addition to gastronomy, tourist passenger transport and the activities of entities facilitating the purchase of the so-called related tourism services, as well as the activities of entities providing tourist attractions and tourist information, can be classified as the basic components of the tourism economy (Panasiuk, 2020). The participants of the tourist market, similarly to other economic entities, are subject to permanent fluctuations caused by various external factors. Many of them are threats that can significantly affect their functioning. Delimitation, as well as the very listing of these threats in the literature on the subject, takes place in different ways, depending on the criteria adopted by the authors (Panasiuk, 2008, 2013; Riganti & Nijkamp, 2008; Zhiyang et al., 2012). It should be added that these phenomena, depending on their nature, may have different durability, range and impact strength. Among the various threats, the most difficult to predict, and at the same time the most radical in their consequences, include natural disasters, industrial accidents (including transport ones), terrorist attacks, economic crises, armed conflicts as well as epidemics and pandemics. Although the tourism business in the current century often has had to face various threats[26], the scope and limitations resulting from the current COVID-19 pandemic[27] take place on an unprecedented scale, which is an unparalleled phenomenon, practically unknown in modern history (Guan et al., 2020; Li et al., 2020; *WHO Director-General's Opening Remarks at the Media Briefing on COVID-19 - 11 March 2020*; n/a, *COVID-19 Map*.; *WHO Coronavirus Disease (COVID-19) Dashboard*; Gossling et al., 2020).

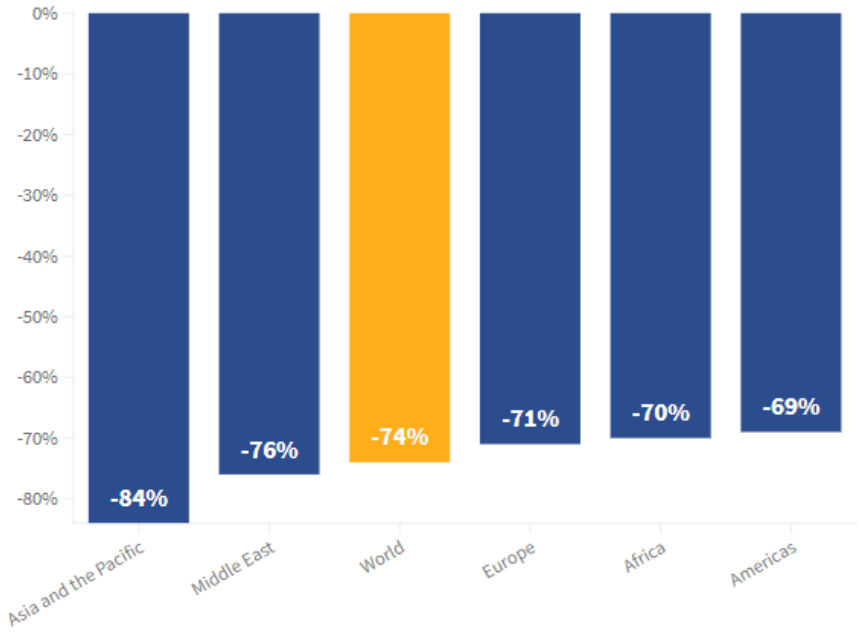
[26] For example, it is worth mentioning here the terrorist attacks on the WTC in New York on September 11, 2001, which severely affected the aviation industry practically all over the world, the bird flu epidemic (2003-2006), the SARS epidemic (2002-2003), the global 2008/2009 financial crisis, swine flu pandemic (2009-2010), Ebola epidemic (2013-2016) or MERS epidemic (2015).

[27] COVID-19 standing for coronavirus disease 2019 - severe acute respiratory syndrome caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) (Gorbalenya et al., 2020; Naming the Coronavirus Disease (COVID-19) and the Virus That Causes It, n/a; "The Illness Now Has a Name, COVID-19", 2020).

The impact of the SARS-CoV-2 coronavirus causing the COVID-19 disease on tourism is discussed in international and national literature from many perspectives and takes into account its many effects. This pandemic, as mentioned, is described in an unprecedented and extremely severe approach (Baum & Hai, 2020), (Breier et al., 2021; Chadee et al., 2021, Panasiuk, 2020). The impact of COVID-19 on tourism is subject to numerous studies in the field of: demand, including tourist behavior (Wojcieszak-Zbierska et al., 2020), supply (Breier et al., 2021), and employee behavior (Park et al., 2020; Jung et al., 2021, Vo-Thanh et al., 2020), or relationships within and outside the industry (Chadee et al., 2021; Vo-Thanh et al., 2020), as well as newly observed phenomena (Clark et al., 2020).

The World Tourism Organization data, presented in Figure 1, clearly shows that the severe changes affect all regions of the world and result in a decrease in arrivals by at least 69% (UNWTO, *2020*, 2021).

Figure 1. Percentage change in the size of tourist arrivals in the world



Source: Source: World Tourism Organization (UNWTO) ©

Data as collected by UNWTO, January 2021. Published: 28/01/2021

The decline in tourist arrivals around the world has an impact on every economy, with particular emphasis on places where tourist traffic was high and accounted for a significant part of gross domestic product. Information from the American agency Electronic System for Travel Authorization (ESTA) concerns the billion-dollar decline in tourism revenues due

to reduced tourist traffic, e.g. in the US - $ 147.25 billion, in France - $ 46.7 billion, and $ 42.03 billion in Spain. In Europe, the largest decrease in revenues has been recorded in Turkey – $ 21.35 billion, the Netherlands (14.86) and Portugal (13.86) (turystyka.rp.pl, 2021). Individual countries and governments are responsible for limitations in world tourist traffic, which, striving for the safety of their citizens, have introduced appropriate restrictions regulating the functioning of the market. The restrictions determined and still determine the functioning of the hospitality industry in Poland and in the world, thus generating specific effects in relation to individual entities.

The impact of COVID-19 on the functioning of the hospitality industry

The pandemic had also influenced decisions made by hotel entities in the field of broadly understood management or marketing (Jiang & Wen, 2020; Vo-Thanh et al., 2020), in order to be able to operate in a new environment in line with market expectations and the restrictions in the world (Bayat, 2020). Offering a hotel product has taken a new form and has been associated with the need to modify the product or other marketing instruments – mix, building and implementing new strategic and operational goals (Bayat, 2020; Jung et al., 2021). Ways and ideas to reduce the negative effects of the pandemic in the hospitality industry were implemented and included, primarily, efforts to operate in a limited scope with ensuring the safety of guests and employees (Jiang & Wen, 2020). Due to the fact that the principles of the indicated functioning, or its complete absence, were and still are dependent on the recommendations, advice, and restrictions of individual countries, Table 1 lists selected solutions, activities taking place in the hospitality industry during the pandemic.

Table 1. Selected solutions implemented in the hospitality industry in the light of COVID-19

Activity tape	Scope	Objective	Description
The way of functioning in changed conditions (exemplified by the Accor group)	international	including security, reduction of operating costs	- business travel ban for all employees, - shortening the working hours or introducing holidays for 75 percent teams from the headquarters in second quarter of 2020, - salary freeze, - reducing capital expenditure with the adjustment of all other costs to the reduced revenues.

Activity tape	Scope	Objective	Description
Counteracting the resignation from purchasing a product (current and future reservations)	international	encouraging customers to fulfil their travel decisions	- #DontCancelPostpone campaign conducted mainly in social media,
	national (Poland)		- #ZmienTerminNieOdwoluj and #WspierajmyTurystyke - Polish equivalent of the #DontCancelPostpone campaign described in the previous point, - promoting domestic tourism
Industry security	international	providing guests with sanitary safety in the facility	- creating a code of good practice containing 40 rules of conduct, guidelines aimed at taking actions to reduce threats and, above all, taking care of the safety of guests. - self-check-in or self-service at the hotel in order to avoid unnecessary physical contact so as to maintain a safe social distance. - non-contact communication between hotel employees and guests using, for example, mobile applications or modern hotel TV systems. - HRS Clean & Safe certificate - a new standard in safety and cleanliness certification in hotels served by HRS. The "Clean & Safe" sign guarantees that a given facility meets as many as 50 requirements grouped in 12 categories, o providing disinfecting liquids for guests and staff, o a contactless service of meals with the "take-away" option and a contactless reception, where without queuing and having to fill out forms, you can safely check in and out of the hotel as well as pay for the stay, o all public places as well as frequently touched surfaces (e.g. door handles) are frequently cleaned and disinfected.
Social involvement of hotels	international and national (e.g. Poland)	social commitment, solidarity, social responsibility	- admitting doctors who fight the pandemic, - delivering food from hotel restaurants to hospitals fighting the virus, - *Mobile* Collection Point (MOP) organized by the Central Clinical Hospital of the Ministry of Interior

Activity tape	Scope	Objective	Description
			and Administration is located in the Courtyard by Marriott Warsaw Airport hotel belonging to the Polish Hotel Holding, which is located directly in front of the Chopin Airport Terminal building.
Changes in marketing and strategic activities	international and national	maintaining contact with the client, building new, impeded relationships with the environment	- use of social media, - new solutions, e.g. in catering, - creating offers adequate to the current customer needs (e.g. security, technological solutions) (Alonso et al., 2020)

Source: own elaboration based on: (Dobry Hotel z certyfikatem HRS „Clean & Safe", 2020; Kamińska, 2020; Morawski, 2021; Stępniak, 2020; WOT, 2020; Alonso et al., 2020)

The actions and solutions indicated in Table 1 not only constitute a form of adaptation of hotels to the existing situation (obligatory - e.g. sanitary; or optional - additional hygienic solutions), but also are a proof of a difficult fight for the client. It is worth noting that customer service solutions such as: self check-in or impersonal, indirect communication can be considered long-term, far-reaching changes in the industry. The changes will include not only the hotels themselves, but also possibly irreversible customer behaviour (e.g. recognition of remote work in the future, restrictions on business meetings, in-house training, etc.). S. Kumar identified certain areas in the hospitality industry that should recover from (Kumar, 2020). The list is so long and relatively complex that the process will take a long time.

Methodology

The aim of this article is to analyse the impact of the COVID-19 pandemic on the functioning of Polish hotels, as well as to identify solutions used in the hospitality industry as part of reducing its negative effects. These solutions were discussed due to the periods selected on the basis of restrictions introduced in Poland in the hospitality industry.

For the purposes of implementing the above-mentioned, the group of all hotels representing all quality categories (1 * - 5 *) was considered the research entity. After formulating the research problem, there was performed an analysis of the existing methods,

which would make it possible to provide answers to the problem questions. Out of numerous survey measurement methods, it was decided to choose the CAWI online survey, which was addressed to hotel facilities.

Based on official data prepared by the Marshal's Offices for the Ministry of Sport and Tourism, and available in the Central Tourism Register and List[28] (Edukacja.gov.pl/cwoh/index, access date: February 5, 2021) as of February 5, 2021, there were 91 five-star hotels, 505 four-star hotels, 1743 three-star hotels, 829 two-star hotels and 265 one-star hotels in Poland; 3,433 hotels in total. This List contains the e-mail addresses of the hotels that were contacted in relation to the online survey conducted for the purpose of the study. The link to the study was also made available in the thematic (hotel) groups of the Facebook social networking site.

102 entities located in Poland took part in the study, which constitutes 3% of the research sample. During the pandemic, which is a particularly difficult time for hoteliers, the obtained result is satisfactory for the researchers. The respondents mainly represented 3-star and 4-star facilities (47% and 28% of respondents), 1-star, 2-star - 19% and 5-star - 6%. In terms of the declared type of hotel, business entities dominated - 59% of responses (including training and conference as well as conference and banquet), tourist (55%) or city (43%) responses. The type of facility could be mixed (e.g. city and tourist at the same time). The survey shows the dominance of facilities with up to 50 employees (74%), with more than 100 employees (14%) and 51-100 employees (12%). Every fourth facility was a chain-brand hotel.

Results and discussion

An extremely important and significant aspect for researchers was to get to know the subjective opinion of hoteliers on the level of ensuring the safety of staying in their facility. According to the research, the vast majority of respondents (88%) believed that they could create safe conditions for guests to stay during a pandemic, and the remaining respondents (12%) believed that they were able to prepare the facility, suggesting the answer "rather yes". It is worth emphasizing that none of the respondents indicated the impossibility of ensuring safety, especially sanitary. In the opinion of their representatives, the surveyed hotels in Poland are properly and reliably prepared to operate in a pandemic. It would be very

[28] particularly in – Central List of Hotel Facilities

valuable to confront the above responses with the opinions of customers of hotel facilities, which in turn would require additional survey research among people using hotel services.

Furthermore, most hotel facilities have implemented measures to prevent the spread of COVID-19 in their facility using: a sanitary regime in line with the recommendations of the Ministry of Health and Social Security (98% indicated by respondents), the possibility of cashless payments and free hygiene protection measures for guests (80%) or ozonation of rooms hotel rooms - 55% of respondents' indications. The time of the pandemic allowed or influenced the implementation of a number of solutions, not only in the field of hygiene, but also: guest service (e.g. videoconferences), facility marketing strategies (new forms of communication), expansion of the customer portfolio or changes in the way employees' work is limited (e.g. multifunctionality, flexible working hours).

The restrictions, prohibitions and orders in Poland are based on regulations that regulate the functioning of the national economy. The regulations apply directly to the hospitality industry and translate into the situation of individual accommodation entities. The relevant periods of the applied restrictions had their assumptions and resulted in specific effects - Table 2.

Table 2. Restrictions, prohibitions and orders with regard to accommodation facilities in Poland during the COVID-19 pandemic

Period	Regulation	Scope of restrictions	Proposed State Support
I March 13, 2020 - May 3, 2020	The Regulation of the Minister of Health of 13 March 2020 regarding the announcement of the state of epidemic threat in the territory of the Republic of Poland	- suspension of international connections (air and rail), - ban on gatherings of more than 50 people, - suspension of the operation of restaurants, bars, cafes, - ban on movements, - closing of gyms, swimming pools, fitness clubs, libraries, cinemas, theatres, a complete ban on conducting activities related to the operation of tourist accommodation facilities and short-term accommodation facilities (included in the Polish Classification of Activities in subclass 55.20), - a sanitary regime is in force	Anti-crisis Shield of 18.03.2020 (*The Anti-Crisis Shield is to protect companies and employees from the effects of the coronavirus epidemic - Coronavirus,* no data), access date 06.02.2021.

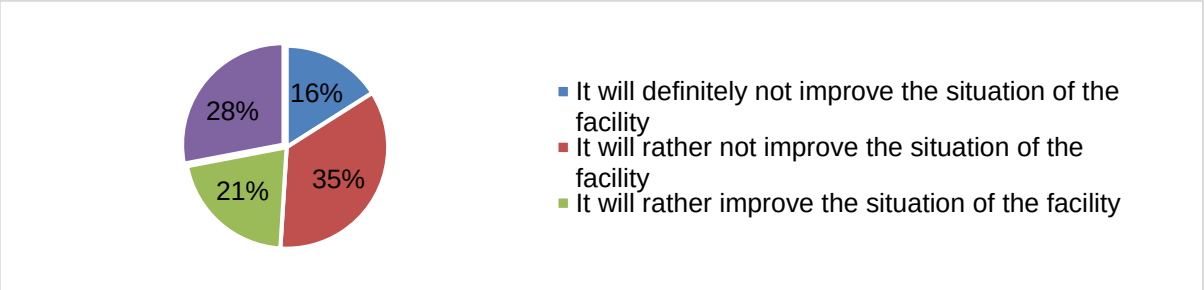
Period	Regulation	Scope of restrictions	Proposed State Support
II May 4, 2020 - October 22, 2020	including: Regulation of the Council of Ministers of 21 December 2020 on the establishment of certain restrictions, orders and prohibitions in connection with the occurrence of a state of epidemic	- hotel services subject to special safety rules, - limited activities of hotel restaurants and recreational spaces in hotels and accommodation establishments, - closed gyms, lounges and swimming pools, - hotel restaurants served meals to hotel guests in their room, - a sanitary regime is in force	
III October 23, 2020 - February 11, 2021	including: Regulation of the Council of Ministers of October 16, 2020 amending the Regulation on the establishment of certain restrictions, orders and prohibitions in connection with the occurrence of a state of epidemic	- Poland as a red zone, - suspension of the operation of health resorts with the possibility of completing already started stays, - hotels available only to guests on a business trip - from November 7 to November 29; - limiting the functioning of hotels - available to uniformed services, medics, patients of specialized hospitals, Central Sports Centres (COS), - exception: open workers hotels, - a sanitary regime is in force	including: -Anti-Crisis Industry Shield (*Anti-Crisis Industry Shield - support for companies in connection with COVID-19 - Coronavirus*), access date 06.02.2021. - additional support: (*Another package of anti-crisis measures for Polish companies - Coronavirus, 2020*), as of 06.02.2021; (*Another support for entrepreneurs - the PFR 2.0 Financial Shield is launched - Coronavirus, 2020*), as of 06.02.2021.
IV February 12, 2021-March 20, 2021	Regulation of the Council of Ministers of February 11, 2021 amending the Regulation on the establishment of certain restrictions, orders and prohibitions in connection with the occurrence of a state of epidemic	- opening of hotels with a reduction of 50% of available rooms - meals served only in rooms, at the request of guests, - closed hotel restaurants, - a sanitary regime is in force - open: cinemas, theatres, operas and philharmonics (maximum 50% of seats may be occupied during cultural events; masks are required; consumption is prohibited). - Open: swimming pools, slopes (aqua parks closed)	

Source: own elaboration based on: (Legal acts and documents issued in connection with COVID-19 - Silesian Voivodship Office in Katowice, 2021), as of 02.18.2021.

So far, the Council of Ministers in Poland has issued 47 regulations, while the Minister of Health has presented 5 ones (as of 02/18/2021) directly related to COVID-19 (Legal acts and documents issued in connection with COVID-19 - Silesian Voivodeship Office in Katowice, 2021). Restrictions, orders or prohibitions also applied to hotels. In the opinion of 51%

of respondents, partial possibility to function in the period 02.14.2021-03.20.2021 definitely not or rather not improve the functioning of the hotel; in the opinion of 49% of them it definitely or rather improved the situation of the hotel (Figure 1). Thus, the opinions are divided and not correlated with the type of facility.

Figure 1. Respondents' assessment of the impact of restrictions on the hotel in the period 02.14.2021-03.20.2021 in Poland



Source: own elaboration

53% of the researched facilities have been operating on the market for over 10 years. When taking into account only these facilities, 60% of them indicated that the possibility of operation in the period of 02.14-03.20.2021 will definitely not or rather not improve the facility's situation. Greater optimism was indicated in the group of hotels operating on the market for 3 to 5 years, where 70% of them indicated that it would rather or definitely improve their situation.

Table 2 shows four specific periods during the pandemic, related to, inter alia, the scope of activities of accommodation facilities in Poland. In the first period, the activity was not possible, but during the next - II and III, the activity could be carried out, but only for guests on a business trip or professional groups directly related to the fight against COVID-19 (e.g. uniformed services, medics). In the fourth stage, it was possible to operate within a maximum of 50% of the facility's occupancy. After March 20, 2021, due to a significant increase in the incidence, the restrictions from the second and third periods were reintroduced.

The majority of the respondents agreed that the limitations in the operation of hotels since the beginning of the pandemic did not allow covering the fixed costs of the facilities they ran (51% of responses; allowed to a small extent - 28%). Fewer than 8% of the respondents declared the possibility of operating at capacity that would cover half of the fixed costs, while

13% declared functioning at capacity that would cover the fixed costs in part or in full (9% and 4%, respectively). Very similar response values were indicated in chained-brand and individual facilities. Importantly, there were no significant differences in this respect between the different types of hotels. A similar structure of responses occurred regardless of the size of the facility, the length of its operation, category or network affiliation[29].

Cost aspects were not the only ones identified in the impact of the hospitality pandemic. Table 3 summarizes the negative and positive effects of the pandemic along with the assessment of their importance in the respondents' facility.

Table 3. Assessment of the impact of the listed effects of the COVID-19 pandemic on the hotel in the opinion of the respondents

Effect	Significant effect	Strong effect	Small effect	Very small effect	Not applicable
Staffing problems	20%	24%	22%	22%	12%
Financial problems	**70%**	**28%**	2%	0%	0%
The need to create new operating strategies	**56%**	**33%**	10%	0%	1%
Risk of guests returning too slowly	**58%**	**35%**	7%	0%	0%
Loss of contracts with contractors	**48%**	**24%**	20%	3%	5%
"Disappearance" of existing contractors from the market	**44%**	**40%**	12%	1%	3%
Debt	48%	14%	22%	9%	7%
Guests' fear of traveling	**48%**	**41%**	11%	0%	0%
A new trend in remote communication	50%	22%	20%	5%	3%
New technological trends (e.g. self check-in, online conferences)	28%	22%	38%	9%	3%
General deterioration of the economic situation in the country and in the world (e.g. business client; limitation of business trips)	**64%**	**28%**	7%	1%	0%
Other (please indicate what?)	8%	3%	10%	3%	76%

Source: own elaboration

The transformations taking place in the hospitality industry can be proved by the fact that 89% of the respondents indicated the necessity to create new operating strategies as a

[29] The strength of the correlation between selected variables was attempted using the V-Cramer coefficient; however, values >0.3 (weak relationship) were obtained.

significant result. Certainly, one of the main areas here may be to encourage the public to travel again, as it was the guests' fear of traveling that was indicated by 89% of respondents.

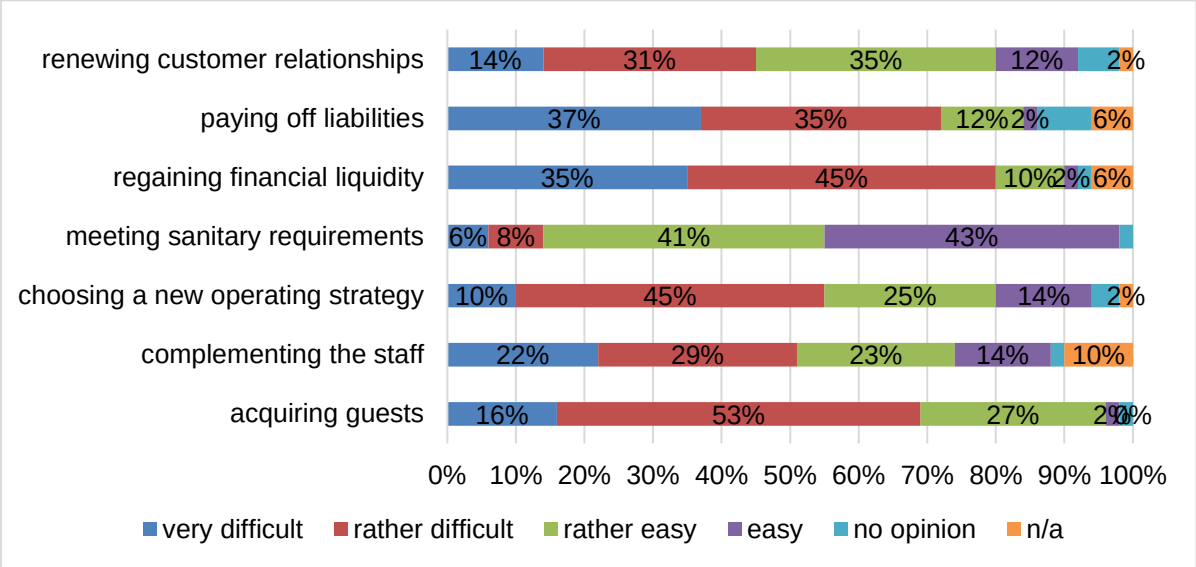
Although many commentators are optimistic about how the tourism market will recover after the pandemic, many authors point out that these predictions are too bright. There is significant evidence that COVID-19 will be a different and breakthrough pandemic for the tourism sector. Governments are just beginning to understand that, unlike other sectors of the economy, tourism revenues are permanently lost as unsold quantities in tourism (for example, accommodation) cannot be marketed in subsequent years, with corresponding employment implications in this sector (Gossling et al., 2020). Another problem that looms over the hospitality industry is that the pandemic causes changes of certain behaviours, which may be permanent. An example may be remote meetings or conferences, which will significantly reduce the need for trips and thus the use of hotel services. This fear is clearly visible in the responses of the respondents to the survey. As many as 84% of respondents are afraid of the "disappearance" of existing contractors from the market, and 72% of them declare their fear of the new trend in remote communication.

The entrepreneurs participating in the survey agreed in the assessment of the effectiveness of the anti-crisis shields offered by the state. As many as 88% of respondents assessed the proposed aid as insufficient (53% - definitely insufficient, 35% - insufficient). In the opinion of less than 10%, this aid was rather (partially) sufficient. Although the Polish government estimates that the total value of the support offered under the Anti-Crisis Shield and the Financial Shield of over PLN 312 billion (*Anti-Crisis Shield - Anti-Crisis Shield - Gov.pl Portal*, 2021), these values are still insufficient.

Hoteliers most often took advantage of the total or partial exemption in paying ZUS contributions (63%) and The Polish Development Fund (PFR) subsidies (61%). More than half of the surveyed facilities also benefited from the possibility of subsidizing the salaries and social security contributions of employees (51%). A lot of respondents declared the use of idle time pay (43%) as well as the possibility of limiting working time (39%). The least popular was aid in the form of recapitalization of a given company (2%) as well as loans and subsidies (19%). 12% of the respondents did not use any form of support.

The research results also allowed to determine the level of difficulty of rebuilding many aspects in the future, assessed by the respondents. These fears will determine the continued existence of the entity on the market. The individual elements are shown in Figure 2.

Figure 2. Assessment of individual aspects in relation to the difficulty of recovering from the pre-pandemic condition



Source: own elaboration

The respondents classified, first and foremost, regaining financial liquidity (80% of respondents), paying off liabilities (72%) and acquiring guests (69%) as very difficult and rather difficult aspects. These elements determine whether a given entity will operate on the market at all, therefore the results indicate a very difficult and uncertain position of the studied facilities. The relatively easy aspects of the respondents included meeting sanitary requirements (84%), which only confirms that the surveyed hoteliers are sure about the security provided in their facility (mainly for the guests, but also the employees).

Summary, recommendations

The discussion allows for a clear assessment of the hospitality industry in Poland during the COVID-19 pandemic. The key aspects indicated by the majority of respondents are the inability to cover the fixed costs of the facility, concerns about regaining financial liquidity or paying off liabilities. In the opinion of the respondents, state support is insufficient, and the restrictions in force make their situation even more difficult. Despite many implemented solutions - creative, pro-social, integrative and technological - the lack of functionality (even to a limited extent) may lead to serious and irreversible changes in the quantitative structure of the market. The confidence of the respondents as to the safety of guests and staff

in the promise, the ability to react quickly to changes in the industry, or openness to innovation should be underlined. The behaviour of the surveyed hoteliers is determined by the struggle for their own facilities, with the awareness of probable difficulties in the future, mainly those related to changes in the way of communication, universal acceptance of remote work by existing business customers. It is certain that with the end of the pandemic, the hospitality industry will recover in the changed market conditions, primarily determined by the demand.

Dealing with the most severe effects of the pandemic will take time, and those which according to the respondents are the most troublesome, have a long-term impact on the operation of the facilities. As far as the financial problems are concerned the solution seems to be clear, emphasized by the hoteliers, to be able to operate without restrictions and limitations. Hoteliers will have to prioritize the safety of their guests and thus ensure that hygienic conditions of the hotel are respected. The challenge of modern tourism will also be to encourage guests to be active and use accommodation facilities. This can be solved by offering guests additional benefits during their stay, a guarantee of safety, cost-free cancellation or rescheduling. Mutual respect and understanding is essential in any facility's relationship with its environment.

Limitations and future research

In future scientific considerations, a very important aspect will be to compare the structure of supply and demand in the hospitality industry before, during and after the pandemic. Tourism trends will change as they determine new solutions, behaviors and expectations. The limitation of this type of research, especially on the supply side of the hospitality industry, is the low level of survey return. The research presented in the article was conducted in the light of the careful observation of hoteliers who, during a pandemic, expressed their regret, dissatisfaction and helplessness in relation to the situation in which they found themselves. The biggest challenges in the second quarter of 2021 include survival on the market, achieving financial stability, maintaining qualified employment, or changes in marketing activities. Assessing the return of the hospitality industry to the pre-pandemic state will be a research challenge.

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Modelling Innovation Contribution to Economic Growth of Industrial Regions

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Abstract: The article considers approaches to determining the innovative contribution to economic growth and economic development. Attempts to make such a determination in the known studies are limited by using methods of: integrated estimation, expert evaluations, multipliers, econometric models. Most of the considered approaches are focused on identifying the innovative impact on economic development, rather than on economic growth. It is proposed to expand the Cobb-Douglas production function by including, in addition to STP, labour costs and capital costs, as well as an innovation factor, which includes: gross domestic R&D expenditures, innovation expenditures, and total education expenditures. To determine the contribution of the innovation factor to economic growth, the "Solow balance method" is used, which, through logarithmization and obtaining logarithmic derivatives in the production function, allows obtaining formalized information about each factor's contribution to economic growth and developing necessary regulatory measures. The method is universal and can be applied to any country, region or type of economic activity.

Key words: economic growth, scientific and technological progress, innovation factors, production function, Solow balance, industrial regions

JEL: B41, C00, O10

Introduction

According to J.A. Schumpeter [2021], innovation is a historically irreversible transformation in the way things are produced. In other words, innovation is the result of investing in the development of new knowledge, innovative ideas for updating various spheres of people's lives and the subsequent process of implementing them, with a fixed value added (profit, lead, leadership, priority, radical improvement, quality advantage, creativity, progress). Innovative processes arise as a result of deviation in the movement of social and

economic system from the planned trajectory under the influence of external and internal factors. Therefore, the innovation process is a social, technical and economic process, which, through the identification of social needs, leads to developing new scientific and technical products, the practical use of which contributes to the socio-economic system's development and supports the planned mode of its operation. Thus, the innovation process covers the entire range of activities: from identifying the need for impending change to their practical implementation in the field of application.

The state of investment and innovation as a catalyst for future economic development is a kind of a barometer of the general economic situation and socially expected transformations in society. In the modern period of the productive forces' rapid development, innovation is the main driving force of the dynamic development of social production. Concepts such as "innovation", "innovation processes", "innovation activity", "innovativeness" are firmly entrenched in our lives. However, the questions remain unanswered: what is innovativeness in a strict, mathematical sense, confirmed by quantitative measurements of innovation availability: "yes" or "no", as a percentage of annual growth among other macro factors, the level of innovation as a share of innovation contribution to GDP growth and its efficiency?

The main tool for estimating the contribution of innovative factors to economic growth is the model of the aggregate supply function, usually based on the Cobb-Douglas production function in its various modifications. Moreover, in most publications, the innovative contribution to economic growth is identified with the definition of the impact of scientific and technological progress (STP). STP is recognized worldwide as one of the main factors of qualitative transformations in the economic system and the most important factor of economic growth and development. Neoclassical theory of innovation was further developed in the framework of the innovation theory by J. Tinbergen, who substantiated the operation mechanism of an exogenous (one that is introduced into the system from the outside) factor - STP - i.e., technical-technological and organizational-managerial innovations based on statistical application of Cobb-Douglas production function, where γ is the rate of STP. The rate of STP is determined by the “Solow balance” method and is equal to the difference between the quantity of output growth (or GDP) and the quantity whose increase is explained by capital and labour growth (as well as production technology - GDP share in output), and serves as a measure of ignorance of economic growth causes. In the production

function, the rate of STP (γ) is present as an indicator of the degree of the member, which determines the STP contribution to output or GDP, in other words - the total factor productivity, which increases or decreases the impact of other macro-factors. If the rate of STP is negative, then the total factor productivity is less than one, if positive - more than one. As an indicator, there can be used either the root cause - the rate of STP, or its result - the total factor productivity; at the same time threshold values change. Such works include the following studies [Solow, 1991; Denison, 1962; Oppenlander, 1980; Caldor, 1957; Hesse, 1969; Brinkman, 1970; Uhlau & Rall, 1970; Tinbergen & Bos, 1967; Welfe, 2002].

There are also other numerous attempts to determine the impact of innovation factors on economic development and economic growth. Such publications comprise [Abazov, 2021; Aleksander et al., 2020; Arefieva et al., 2021; Boiko et al., 2019; Bogachov, et al., 2020; Borychowski et al., 2020; Chygryn, et al., 2020; Cyfert et al., 2020; 2021; Czakon et al., 2020; Czyżewski et al., 2019; 2020; Dalevska et al., 2019; Dementyev & Kwilinski, 2020; Dementyev et al., 2021; Dyduch, 2019a; 2019b; Dzwigol, 2019a; 2019b; 2020a; 2020b; 2021a; 2021b; 2021c; Dzwigol & Wolniak, 2018; Dzwigol & Dźwigoł-Barosz, 2018; 2020; Dzwigol et al., 2020; Gorynia, 2019; Gorynia et al., 2019; Hysa et al., 2020; Kaźmierczyk & Chinalska, 2018; Kharazishvili et al., 2021a; 2021b; Khrapkina et al., 2021; Koibichuk, 2021; Kondratenko et al., 2020; Kuzior et al., 2019; 2021; Kwilinski, 2018a; 2018b; Kwilinski et al., 2019a; 2019b; 2020a; 2020b; 2020c; Kwilinski & Kuzior, 2020; Kyrylov et al., 2020; Lyulyov & Pimonenko, 2017; Lyulyov et al., 2018; 2020a; 2020b; 2021a; 2021b; 2021c; Maradana et al., 2017; Mlaabdal et al., 2020; Miskiewicz, 2018; 2019; 2020a; 2020b; 2021; Miśkiewicz & Wolniak, 2020; Melnychenko, 2019; 2020; 2021; Polcyn, 2018; Pająk et al., 2016; 2017; Pisarenko et al., 2015; Prokopenko & Miskiewicz, 2020; Saługa et al., 2020; Savchenko et al., 2019; Tkachenko et al., 2019a; 2019b; 2019c; Trąpczyński et al., 2019; Xu & Li, 2020; Wang & Miao, 2021; Van der Waal et al., 2021; Wang & Lu, 2020; Zastempowski et al., 2020].

Based on Lucas's theory of endogenous growth [Xu & Li, 2020], there is used a panel data model and spatial econometric methods to study the relationship between innovative human capital and provincial economies (regional economies with varying degrees of openness).

The article [Wang & Miao, 2021] focuses on evaluating people's living standards and well-being in the context of broader economic growth and technological innovation, as well as political discussions through technology criticism. For such an evaluation, a network

analysis of short-term destructive aspects of technological change is proposed. It is noted that the attitude of economic analysis to communication and cultural technologies and public policy is the role of innovation in promoting economic growth and gaming opportunities. The results of this study will determine the impact of continuous development.

The study [Van der Waal et al., 2021] provides an idea of technical innovations related to sustainable development goals, while comparing it with the disclosure of sustainability information allows a better understanding of the strategic coherence between the two topics and to judge the latter. Moreover, innovation efforts can be quantified by R&D expenditures or intellectual property rights. The article expresses an important opinion that there are no single memories of what exactly sustainability means, how it can be achieved and what types of innovations can be called sustainable. The main outcome of this research is to determine the largest MNEs relevant for the purposes of sustainable development of innovations using a new methodology based on content analysis and patents using multidimensional regression analysis.

The article [Wang & Lu, 2020] attempts to explain the impact of structural change on innovation, using a combination of A. Schumpeter's views on innovation and S. Kuznets theory of delay on structural change. Using a global sample from 1970 to 2012 for a group of 75 developed and developing countries using physical instruments (2SLS) and a systematic GMM assessment methodology, the authors find a significant positive effect of the services sector share and a significant negative impact of the agricultural sector share on innovation.

The study [Hysa et al., 2020] identifies the main components of a closed-loop economy that contribute to sustainability and development, examines the impact of these variables on the economic growth of the European Union (EC 28), and checks whether three components of sustainable development (economic, social and environmental) are important for economic growth. The main toolkit of the study is multidimensional regression analysis. The main findings of the research are the confirmation of the positive impact of circular economy indicators and sustainable development indicators (economic, social, environmental) on economic growth, as well as the proof of the need for innovation and cooperation among academia, government, business and civil society. The conclusions are so trivial that you do not need to go to a fortune teller. However, there is no answer to the question: what is the increase (in%) of innovation factors and its share in the economic growth of each of the 28 EU countries?

The article [Maradana, et al., 2017] is devoted to studying the long-term relationship between innovation and economic growth per capita in 19 European countries for the period of 1989-2014. The main research tool is regression models. This study applies six different indicators of innovation: resident patents, non-resident patents, research and development costs, research and development scholars, high-tech exports, as well as articles in scientific and technical journals to study this long-term relationship with economic growth per capita.

Usually, economic development is studied in the long run, with its leading structural indicator being GDP per capita, which reflects the average income per capita without differentiating its distribution by population groups (as the average temperature in the hospital). According to this indicator, countries are divided into developed and developing ones. GDP per capita can be both in nominal and real (taking into account the GDP deflator) monetary terms. Thus, economic development is a multifactorial process that reflects the interaction of many factors of supply and demand, changes in all spheres of the country's economic life, so it can be productively analysed only in the long run, as done in the article. In the short run, economic growth is measured by *the annual growth rate in percentage* relative to the previous period, for which the nominal GDP of the current period is translated into the real one using the GDP deflator of the current period and refers to the nominal GDP of the previous period in percent.

There are also comments on the explanation of indicators in table. 1.

- "GDP – economic growth per capita: economic growth of the country's economy, expressed in gross domestic product per capita." From this definition, it is unclear what GDP means: nominal, real, or as a percentage growth rate?
- "RDE – research and development expenses: expressed as a percentage of real gross domestic product." Thus, nominal GDP is translated into the real one, divided by the GDP deflator of the current period. Since research and development expenses are usually published by government statistic bodies in current (nominal) prices, to determine this ratio, these costs must also be translated into real terms using a research and development cost deflator. If this is not done, all further conclusions and recommendations do not make sense because they are inadequate.

- "THE – high technology exports: expressed as a percentage of real gross domestic product." A similar remark, i.e., high-tech exports, should also be translated into real terms using the high-tech export deflator.

Using the Granger causality test, the study [Maradana, R.P. et al., 2017] reveals the existence of both one-way and two-way causal link between innovation and economic growth per capita. It should be noted that the use of the Granger causality test is not a panacea for all problems. First, the Granger test for causality is a procedure to check the causal (non-causal) relationship between time series. That is, Granger causality is a necessary but insufficient condition of causation.

In this study, the authors use both types of innovation indicators: *costs* and *results*, i.e., *causes* (costs of research and development, researchers engaged in R & D) and the *outcome* of innovation activity (patents filed by residents, patents filed by non-residents, high technology exports, articles in scientific and technical journals and, finally – GDP per capita). Thus, in the study, the outcomes of innovation activity, that is, the consequences, again act as the causes of innovation activity, which affects the global result – GDP per capita, which contradicts the concept of causality according to Granger.

That is, under the influence of a reason (R & D costs, researchers engaged in R & D, and others) there occurred an innovative activity that led to an increase in patents, high technology exports and articles in scientific and technical journals, which was reflected in GDP. To use a repeated consequence as a new cause of the same research is nonsense. In fact, there are a lot more reasons for innovation than the authors of the article think. To determine the impact of innovation factors (and any others) on GDP, there are powerful macroeconomic models of general economic equilibrium, for example [Kharazishvili et al., 2013]. Therefore, the use of much more simplified regression models without confirming their adequacy (R2> 0.9) and predictive capacity (determining the forecasting horizon with a given error) is questionable. It is expedient to use together both types of indicators (costs and outcomes) at an integrated estimation of innovative activity [European Innovation Scoreboards, 2020; Kharazishvili et al., 2021a; Kharazishvili et al., 2021b].

The work of the Ukrainian Institute of Scientific, Technical and Economic Information [Pisarenko et al., 2015] is noteworthy as it considers various methodological approaches to evaluating the impact of innovation activity on economic growth: *method of constructing integrated indicators* refers to international indices, such as innovation capacity index,

knowledge economy index, global innovation index and others; *method of expert estimates* – the most commonly used methods are peer review, round table, brainstorming, Delphi, foresight; *method of the system of indicators* – such a system should monitor the progress towards the set goals and evaluate the actions' effectiveness; *methods using econometric models* based on the use of econometric models, in particular the Cobb–Douglas function, which allows determining the influence of individual factors on the overall GDP growth. Another approach proposed by the authors is the multiplier method for estimating the impact of innovation on economic development in Ukraine.

Of the four proposed methods, only one (the latter) is theoretically suitable for determining the impact of innovative factors on economic growth. Others are useful to determine the impact on economic development.

Thus, the purpose of the article is to develop a modification of the Cobb–Douglas function in the aggregate supply model to evaluate also separately the innovative contribution to economic growth along with the contribution of labour costs, capital costs and STP.

A Methodological Framework of the Study

As a result of generalizing examples of applying the Cobb-Douglas production function for estimating the innovative contribution to economic growth, there were revealed remarks that concern using: in the left part of the equation, not GDP, but output; labour costs, not the number of workers or man-hours worked; the effective number of taxpayers, not total employment; the transferred capital taking into account the GDP deflator, consumption of fixed capital and investments of previous periods; capital utilization ratio; dynamic coefficients of elasticity [Kharazishvili, 2018, pp.8-9].

Taking into account the revealed remarks, the model of the aggregate supply function is based on the neoclassical Cobb–Douglas production function with a return sustainability on scale in the form of J. Tinbergen [Tinbergen, 1967], with Hicks-neutral technical progress, decreasing marginal productivity of macro-factors with limitations of their interchangeability. This approach, taking into account the identified remarks, provides a causal functional (rather than statistical) relationship between input and output variables, is characterized by dynamic coefficients of elasticity, capital utilization ratio and allowing for the innovation factor in each period [Kharazishvili & Liashenko, 2021c, p. 10]:

(1) $$V_t^S(P_t) = e^{\gamma t}\left[\xi_t N_t(P_t)\frac{W_t}{P_t}k_{sn}\right]^{a_t}(\vartheta_t K_t)^{1-a_t-\beta_t}\left(\frac{G_{in,t}}{P_t}\right)^{\beta_t};$$

where V_t^S is the actual output of aggregate supply; $e^{\gamma t}$ is scientific and technological progress (STP); γ is STP rate; $\xi_t = N_{ef,t} / N_{zag,t}$ is the share of the effective number of taxpayers in total employment; $N_{ef,t}$ is the effective number of taxpayers (hired employees plus another category of employees, reduced to the equivalent of hired employees for all taxes and wages); $N_{zag,t}$ is overall employment; $N_t(P_t)$ is the function of optimal demand for labour, determined from the condition of value equality of the marginal product of labour to the nominal wage rate; W_t is average annual nominal wages of hired employees; $k_{sn,t}$ is a coefficient of social loads; ϑ_t is capital utilization ratio; K_t is capital costs; α_t is a coefficient of elasticity at labour costs; β_t is a coefficient of elasticity at innovation costs; $1-\alpha_t-\beta_t$ is a coefficient of elasticity at cost of capital; $G_{in,t}$ is nominal innovation costs; P_t is GDP deflator; *t* is the period of time.

In equation (1), to determine GDP instead of output, such a transition is provided by taking into account the coefficient of manufacturability (σ_t), which in each period is determined by the ratio of GDP to output according to the macroeconomic identity "*output equals the sum of intermediate consumption and GDP*":

(2) $$GDP_t(P_t) = \sigma_t V_t^S(P_t)$$

Thus, the production function, along with the cost of labour and capital, takes into account the costs, which, in our opinion, reflect the reason (gross internal costs of R & D, innovation costs and total education costs) of the output (consequence) of innovation:

(3) $$G_{in,t} = G_{NDR,t} + G_{in.vit,t} + G_{osv,t}$$

where $G_{NDR,t}$ is the nominal amount of gross domestic expenditure on R & D; $G_{in.vit,t}$ is the nominal amount of innovation costs; $G_{osv,t}$ is the nominal amount of total education expenditures.

Formalized equations of the macro-factors' contribution to economic growth are obtained using the method of *"Solow residual"*, namely, through logarithmization and obtaining logarithmic derivatives (in the following formulas to simplify them, the time symbol t is omitted, but implied):

(4)
$$\ln V = \gamma t + a(\ln \xi + \ln N\,0{,}001 + \ln W - \ln P + \ln k_{sn}) + (1-a-\beta)(\ln \vartheta + \ln K) + \beta(\ln G_{inn} - \ln P);$$

(5)
$$\frac{d\ln V}{dt} = \frac{\dot{V}}{V} = (\gamma + \dot{\gamma} t) + \dot{a}(\ln \xi + \ln 0{,}001N + \ln W - \ln P + \ln k_{sn}) + a\left(\frac{\dot{\xi}}{\xi} + \frac{\dot{N}}{N} + \frac{\dot{W}}{W} - \frac{\dot{P}}{P} + \frac{\dot{k}_{sn}}{k_{sn}}\right) - \dot{a}(-\beta)(\ln \vartheta + \ln K) - \dot{\beta}(-a)(\ln \vartheta + \ln K) + (1-a-\beta)\left(\frac{\dot{\vartheta}}{\vartheta} + \frac{\dot{K}}{K}\right) + \dot{\beta}(\ln G_{inn} - \ln P) + \beta\left(\frac{\dot{G}_{inn}}{G_{inn}} - \frac{\dot{P}}{P}\right),$$

where $\frac{\dot{V}}{V}$, $\frac{\dot{\xi}}{\xi}$, $\frac{\dot{N}}{N}$, $\frac{\dot{W}}{W}$, $\frac{\dot{\vartheta}}{\vartheta}$, $\frac{\dot{K}}{K}$, $\frac{\dot{P}}{P}$, $\frac{\dot{G}_{inn}}{G_{inn}}$, $\frac{\dot{k}_{sn}}{k_{sn}}$ are rates of the corresponding variables; $\dot{\gamma}$, $\dot{a}$, $\dot{\beta}$ are derivatives of the STP rate (acceleration) and coefficients of elasticity at labour costs and innovation costs (N is set in million people, W is UAH per year; all other values are in billion UAH).

The growth rates of these variables are calculated using the appropriate deflators of the current (for output and wages) and previous (for capital) periods. Therefore, the STP contribution to the growth rate of output materialized in labour makes (6),

(6)
$$Tempo\_L = \dot{a}(\ln \xi + \ln 0{,}001N + \ln W - \ln P + \ln ksn) + \left(\frac{\dot{\xi}}{\xi} + \frac{\dot{N}}{N} + \frac{\dot{W}}{W} - \frac{\dot{P}}{P}\right);$$

TP materialized in capital (10):

(7)
$$Tempo\_K = \dot{a}\beta(\ln \vartheta + \ln K) + \dot{\beta}\, a(\ln \vartheta + \ln K) + (1-a-\beta)\left(\frac{\dot{\vartheta}}{\vartheta} + \frac{\dot{K}}{K}\right);$$

STP materialized in innovations (8):

(8)
$$Tempo\_Innov = \dot{\beta}(\ln G_{inn} - \ln P) + \beta\left(\frac{\dot{G}_{inn}}{G_{inn}} - \frac{\dot{P}}{P}\right).$$

Knowing the contribution of each factor to the economic growth of output or GDP, it is possible to determine the rate of STP for the equation of GDP or output:

for the GDP equation:

(9)
$$Tempo\_STP = Tempo\_GDP - Tempo\_L - Tempo\_K - Tempo\_Innov - Tempo\_\sigma;$$

for the output equation:

(10)
$$Tempo\_STP = Tempo\_V - Tempo\_L - Tempo\_K - Tempo\_Innov;$$

All these defined equations are an appendix to the equations of the aggregate supply function model, in which all the necessary macro indicators are calculated [Kharazishvili, 2006, pp.62-64].

Results Modelling

The developed methodology for estimating the innovative contribution to economic growth is universal and can be applied to any country, region or type of economic activity. As an example, the areas of the Podilia economic territory of Ukraine were selected: Vinnytsia and Khmelnytskyi regions. After performing the relevant calculations, there were obtained estimates of the macro-factors' quantitative contribution to GRP economic growth as a percentage increase.

The 2001-2020 average results of their impact on the economic growth of these regions of Ukraine are given in Table 1.

Table 1 Average annual values of the contribution of production factors to GRP growth*

% Increase per year

Regions	*GRP Gross regional product*	*STP*	*L Labour*	*K Capital*	*σ manufacturability coefficient*	*Innovation*
Vinnytsia	**4,014**	-3,825	4,014	2,802	0.366	**0.515**
Khmelnytskyi	**3,083**	-5,59	4,548	2,509	0.695	**0.949**

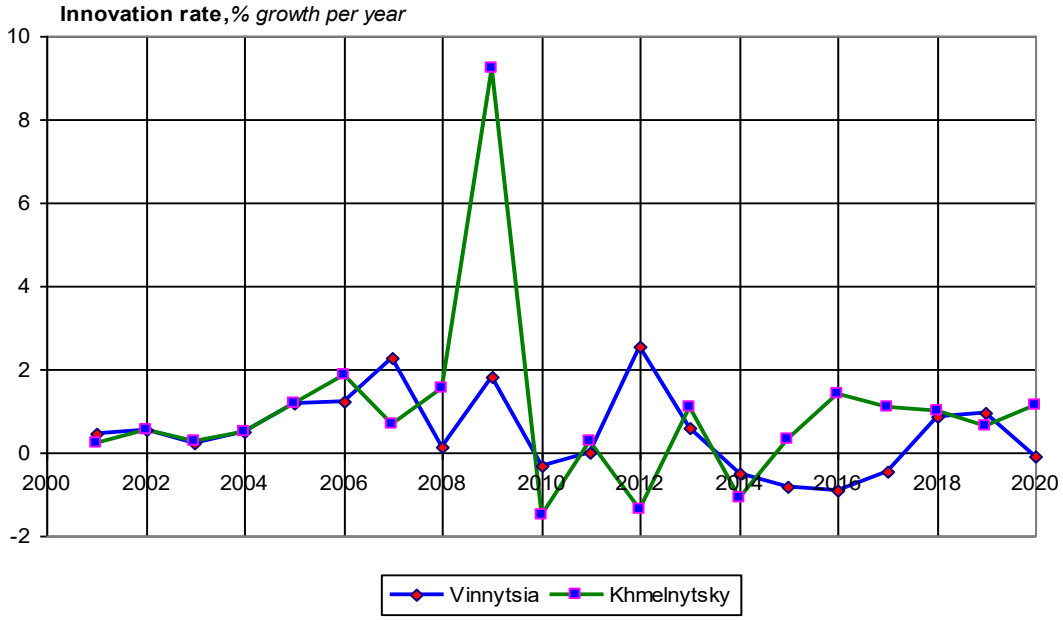
* *Calculated by the authors.*

Analysis of the dynamics of the average annual (over 20 years) contribution of production factors to the GRP growth rates in the determined regions of Ukraine shows that the greatest impact on the positive GRP growth was exerted by (in the appropriate sequence):

- in Vinnytsia region: labour costs, capital costs, innovation factors, manufacturability;
- in Khmelnytskyi region: labour costs, capital costs, innovation factors, manufacturability;

Unfortunately, for the determined period, in the considered regions of Ukraine, STP had a negative contribution, i.e., it reduced the return from macro factors. The dynamics of the innovative factors contribution to the GRP economic growth in the regions of the Podilia economic territory of Ukraine is shown in Fig. 1.

Figure 1. The dynamics of the innovative factors' contribution to the economic growth of GRP.



The most promising, high-quality and long-term factors of influence are innovation factors, on which the latest technological developments, the efficiency of innovation results and the transition to a higher technological structure depend. It can be argued that no country or government can be competitive without scientific support, which in turn is achieved through adequate R&D funding, innovation and education spending, and investment in human capital.

Given the calculations done, an important question arises: what percentage of GRP economic growth is provided by innovative factors? Since both the innovative contribution to the economic growth of GRP (annual growth rate) and the growth rate of real GRP in a given period can be both positive and negative, there are four options for calculating this impact (12) (Fig. 2).

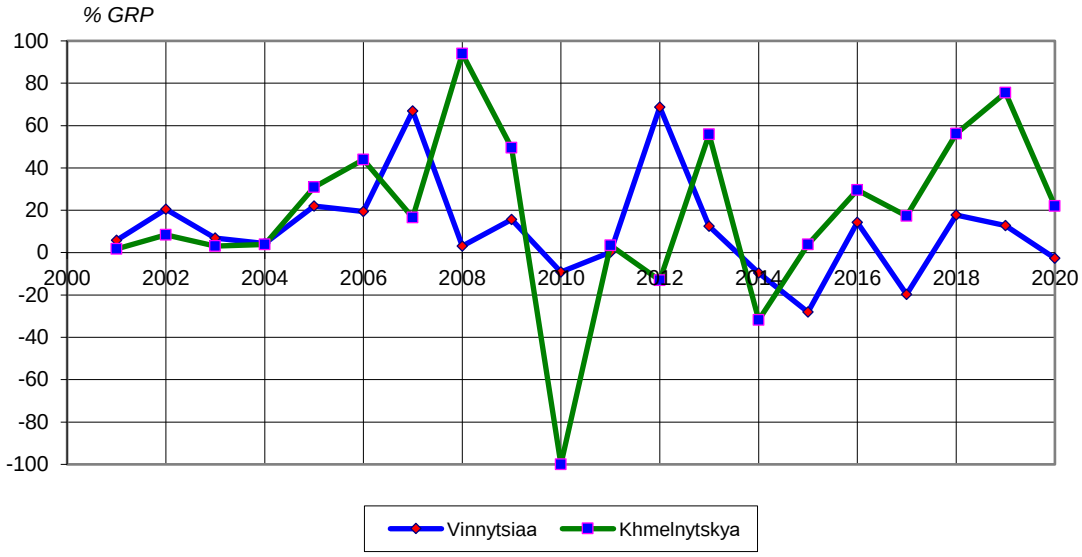
Innovative factors, averaged over 20 years, affect the economic growth of the Podilia economic territory, which is limited to the contribution of 0.52-0.95% growth of real GRP and is reflected in the following *average* percentage contribution to GRP growth:

- Vinnytsia region - 11.1%;
- Khmelnytskyi region - 18.5%;

$$(12)\quad R_{innov,t} = \begin{cases} \dfrac{Tempo\_Innov_t}{Tempo\_GDP_t} \cdot 100\%, if\ a\ Tempo\_Innov_t > 0, Tempo\_GDP_t > 0; \\ \dfrac{Tempo\_Innov_t}{Tempo\_GDP_t + |Tempo\_Innov_t|} \cdot 100\%, if\ a\ Tempo\_Innov_t < 0, Tempo\_GDP_t > 0; \\ \dfrac{Tempo\_Innov_t}{|Tempo\_GDP_t| + |Tempo\_Innov_t|} \cdot 100\%, if\ a\ Tempo\_Innov_t > 0, Tempo\_GDP_t < 0; \\ \dfrac{Tempo\_Innov_t}{|Tempo\_GDP_t|} \cdot 100\%, if\ a\ Tempo\_Innov_t < 0, Tempo\_GDP_t < 0; \end{cases}$$

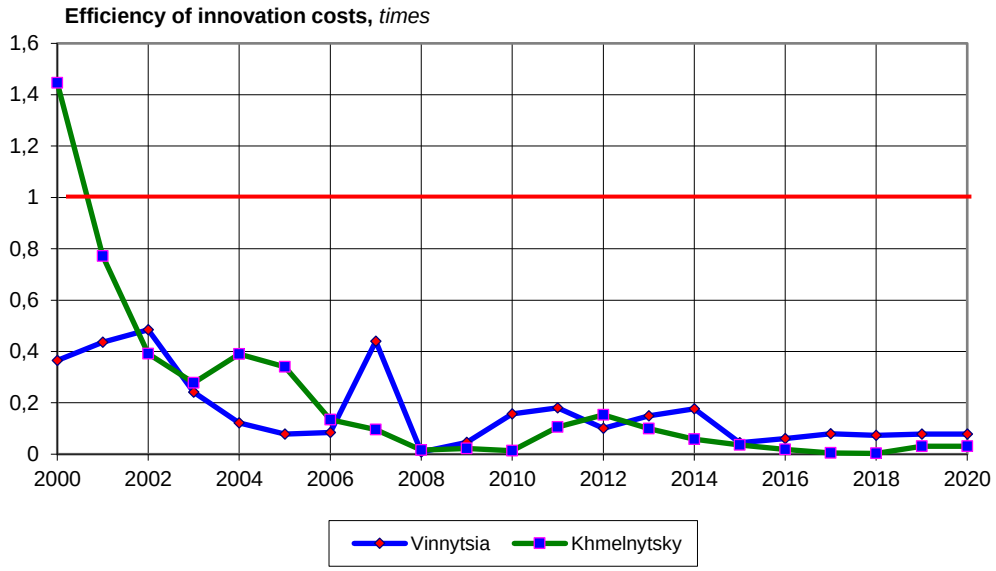
where $R_{innov,t}$ is a share of innovation contribution to GRP economic growth, %.

Figure 2. The share of innovation in the economic growth of GRP.



The effectiveness of costs on innovation factors can be assessed by the ratio of the effect obtained from innovation activities (volume of sold innovative products) to the total cost of innovation factors: (Fig. 3).

Figure 3. Efficiency of innovation costs in the regions of Ukraine



Obviously, if this indicator is more than one, innovative investments can be considered effective. Unfortunately, the effectiveness of innovation costs of the Podilia economic territory for the last 10 years is approaching zero. Moreover, the dynamics of this indicator correlates with the dynamics of the share of wages in output and, accordingly, with the shadowing of the economy, because it is hired employees who are the authors of innovative solutions, and their wages are an incentive to innovate.

Discussion

The analysis of most scientific papers on determining the innovative contribution to economic growth is actually focused on determining this impact on economic development in the long run. This conclusion is confirmed by the final indicator of impact - GDP per capita, which characterizes the overall development in the long run. Different approaches are used for this definition, such as the toolkit of regression equations, the method of constructing integrated indicators, the method of the system of indicators, the method of expert evaluations, the method of multipliers.

The analysis of the approaches used revealed a set of remarks on econometric methods. Unfortunately, correlation-regression analysis of the relationships among macro indicators allows identifying only the average pattern and does not provide strict and accurate correspondence in each case, and only an average correspondence can be observed. Hence

there is a low accuracy of such models. Expert assessments are full of subjectivity and do not rule out fundamental errors.

In the short run, economic growth is measured by *annual growth rates as a percentage* relative to the previous period. Based on the analysis of the quantitative assessment of the innovation impact on the dynamics of economic development and determining its endogenous contribution to economic growth, it was found that in foreign publications, it is identified with determining the impact of scientific and technological progress. The main toolkit of this determination is the Cobb–Douglas function in its various modifications, for which a number of remarks are outlined. In this case, the impact of innovation factors on economic growth is not considered separately.

In contrast, there is proposed an approach based on the neoclassical Cobb–Douglas production function with a return sustainability on scale in the form of J. Tinbergen, with J. Hicks-neutral technical progress, declining marginal productivity of macro factors with limited interchangeability, which provides a causal functional (rather than statistical) relationship between input and output variables, which does not require long time series, is characterized by dynamic coefficients of elasticity, capital load factor and the ability to take into account the innovation factor in each period.

In addition to STP, labour costs and capital costs, the expansion of the Cobb-Douglas production function also includes an innovation factor, which comprises: the volume of gross domestic expenditure on R&D, the volume of innovation expenditures, the volume of total education expenditures. To determine the contribution of the innovation factor to economic growth, the "Solow balance method" is used, which, through logarithmization and obtaining logarithmic derivatives in the production function, allows obtaining formalized information about the contribution of each factor to economic growth and developing necessary regulatory measures.

Innovative factors of Podilia economic territory (Vinnytsia and Khmelnytskyi regions), averaged over 20 years, have an impact on economic growth, which is limited to the contribution of 0.515-0.949% of real GRP growth and is reflected in the *average* percentage contribution to GRP growth: Vinnytsia region - 11.1%; Khmelnytskyi region - 18.5%. To calculate the percentage contribution, calculation formulas are derived for all possible cases of the ratio of the growth of innovation factors to the increase of economic growth. To determine the innovation effectiveness, there is calculated the ratio of the volume

of innovative products sold to the total cost of innovation, which shows a very low efficiency. The low efficiency of innovation indicates the absence of a causal link between the cost of innovation and its results, or low costs of innovation. Hence the question arises: what should be the funding of innovation to obtain the desired effect?

The proposed method of expanding the Cobb-Douglas production function by including labour costs, capital costs and innovation factor in addition to the macro factors of STP is universal and can be applied to any country, region or type of economic activity. Its application allows obtaining the necessary information on the current impact, which is the basis of strategic planning and development of appropriate strategic scenarios.

The research topic to follow may be a scientific justification of the necessary values of innovation factors to achieve the desired level of GRP growth and the level of innovation. The tool of such research can be methodology of strategizing, which uses the principle *"the future is determined by the trajectory into the future"* instead of the principle of classical forecasting, "the past determines the future" [Kharazishvili, 2019].

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The political business cycle in municipalities in Poland 2001-2019

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Abstract: The aim of the article is to identify the symptom of the political business cycle at the local level in Poland, consisting in increasing budget expenditures during election years in urban, urban-rural and rural municipalities. The article reviews previous empirical studies in foreign and domestic literature. On the basis of data on budgets of local government units in Poland published by the Central Statistical Office for the period 2001-2019, an analysis of the dynamics of total expenditure was carried out and then econometric time series models were estimated using the Cochrane-Orcutte method (autocorrelation correction of the random component). On the basis of calculations of the rate of change of expenditures in the studied period, relatively strong dynamics of expenditures was found in the election years and its significant deceleration in the first years of subsequent terms (with some exceptions). In the models of total, current and property expenditures, apart from the explanatory variable "total income", a zero-one variable was introduced, assuming the value "1" for election years and the value "0" for the remaining years. Thus, the statistical significance of the influence of the election year on the formation of expenditures was measured and weighted independently of the level of total income in municipalities in the cross-section under study. The research hypothesis that there is a significant impulse to increase expenditures in election years in Polish communes and that it is stronger in rural than in urban communes was positively verified. The variable "election year" in the models of total expenditures of rural and urban-rural municipalities turned out to be statistically significant at the level of significance lower than 0.01, while in urban municipalities at the level of significance from 0.01 to 0.05. This means that the impulse to increase expenditures in rural municipalities during the election period is more significant than in urban municipalities. Furthermore, the study found that this symptom relates to property expenditure and not to current expenditure. Thus, this paper has partially filled the research gap regarding the identification of the political business cycle in the cross-section of municipalities into urban, urban-rural and rural.

Key words: political business cycle, local governments budgets, fiscal policy

JEL: H7

Introduction

The political business cycle in the fiscal policy of public finance sector entities has been the subject of scientific research for many years. There have been studies on its various aspects, which focus on the expansive fiscal policy in pre-election periods, sometimes detached from the economic business cycle. This phenomenon is the result of the rulers' determination to win political elections. This research concerns both the central and local levels (local government units) with the predominance of the former. The identification of this phenomenon is important due to the growing risk of over-indebtedness and shifting the burden of its repayment to political successors. The existence of a political business cycle manifests itself primarily in an increase in budget expenditure in the pre-election period and

its decline at the beginning of the next electoral term. This area of research has been the subject of a number of studies in foreign literature, while in Poland, and particularly at the local level, it is less well known. As the distance between the rulers and the voters is different in urban and rural areas, this article attempts to identify the political business cycle in the cross-section of municipalities into urban, urban-rural and rural. The study of the cycle in such a cross-section may be important, because it seems that the smaller the municipality, the greater the risk and scale (about 80% of municipalities in Poland are rural) of this phenomenon. Therefore, the article assumes the hypothesis that in election years there is a political impulse to increase budget expenditures in communes and it is stronger in rural than in urban communes. Thus, this is another manifestation of the occurrence of a political business cycle in municipalities in Poland. The aim of this paper is to identify the political business cycle in the cross-section of urban, urban-rural and rural municipalities in Poland. This identification will be done on the basis of determining the impact of the electoral period on the formation of total expenditure and broken down into current and property expenditure. The source of data are CSO studies on financial management of local government units in Poland in 2001-2019.

Literature review

M. Kalecki (1940s) is regarded as the forerunner of the study of the political business cycle. The work of the Polish economist triggered a discussion on the possibility of economic fluctuations determined by political factors. According to this theory, this social group, as opposed to the working class, exerts pressure on the decisions of politicians, causing cyclical economic fluctuations [Kalecki, 1943].

The heyday of research on the sources of expansionary fiscal policy in pre-election periods and the resulting potential disruptions to the course of the "natural" business cycle in the world economic literature was in the late 1960s and early 1970s. The author considers W. Nordhaus [Dubois, 2016] to be the creator of a formalised theory of the political business cycle at the macroeconomic scale. This theory is based on the public choice model and the Philips curve. It assumes adaptive inflation expectations and naive retrospective voting [Swianiewicz & Kurniewiecz, 2018, pp. 56]. Nordhaus assumed that voters have a “short memory”, little knowledge of processes in the economy and make electoral decisions based

on the current economic situation, in this model specifically on the current unemployment rate and inflation [Pacześ, 2011, pp. 217]. As a result, those in power whose goal is to win re-election pursue an expansionary fiscal policy in the election year, which leads to a reduction in unemployment immediately before the election and results in an increase in inflation after the election. This, in turn, forces a restrictive monetary policy in the first years of the new term causing economic fluctuations conditioned by political decisions.

Nordhaus's theory was modified in subsequent decades to account for the occurrence of, inter alia, the phenomenon of asymmetric information regarding politicians' competences. Since voters do not sufficiently know the competences of politicians seeking re-election, politicians send impulses about their competences and credibility by pursuing an expansive fiscal policy during the election period, and after the election they pursue a restrictive policy to prevent excessive debt, which results in cyclical fluctuations in the economy [Rogoff, 1990]. More recent work has described models that import the phenomenon of the so-called "fiscal illusion", which has been described extensively earlier in the literature. In the area of political business cycle research, it consists in increasing budget expenditures while masking the increase in the tax burden under the conditions of a complicated tax system, so that voters are not aware of it during the election campaign [Mourao, 2008]. The phenomenon of making budgets less transparent by politicians, leading to an increase in the transaction costs of monitoring fiscal policy was pointed out, among others, by A. Alesina and R. Perrotti [1996, pp. 401-407].

Over time, the study of political cycles has descended from the national to the local level. E. R. Tufte [1978, pp. 143] found that the tendency to pursue policies of immediate benefit while deferring hidden costs may be more pronounced at the local government level than at the central level and referred to it as "short-sighted politics for short-sighted voters". P. E. Mouritzen [1989, pp. 37], identifying local political cycles in Scandinavian countries, Italy and France, pointed out that although local politicians have fewer policy instruments, they still seek to maximise voter support by appropriately timing the benefits and costs of fiscal policy (spending rises faster the closer to an election and taxes increase in the middle of the next term). L. G. Veiga and F. J. Veiga [2004] conducted an analysis of local government budget expenditures in Portugal between 1979 and 2000, in which they showed that local government bodies systematically increased spending, especially investment spending, during election years. Similar conclusions were also reached by R. N. Baleiras and J. d. S Costa [2004,

pp. 655] indicating that the electoral calendar, re-election decisions and political cohesion are determinants of local government investment spending in Portugal. A study of the political cycle at the local government level in Spain for the period 1993-2003 positively verified the hypothesis that larger subsidies during the pre-election period are given to those local governments that belong to the same party as the governing higher level of the country's administrative division in order to increase the chances of a specific political party winning the local elections [Sole-Ole & Soribas-Navarro, 2008]. Since local politicians have fewer economic instruments than central authorities to win electoral votes, they primarily use public investments and projects, as evidenced by the increasing level of investment spending in the pre-election period. This research highlights the fact that local politicians schedule the delivery of projects for public use for the years in which elections are held. Moreover, the local cycle phenomenon in the Czech Republic is more pronounced in urban municipalities due to the fact that these municipalities have better bargaining power than rural municipalities in reaching for debt instruments [Placek, Pucek, Ochrana, Krapek & Matejova, 2015].

The topic of the political business cycle at the local government level in Poland has not been yet sufficiently recognised, although local government officials in Poland confirm in anonymous surveys that the shape of local government budgets in the election period is also determined by determinants of a political nature [Swianiewicz, 2016]. The political cycle is more visible on the expenditure side than on the revenue side of the budgets of local government units in Poland. Since autonomous (in the sense of setting rates) local taxes are a small part of both municipal budgets (about 20%) and the household budgets of most voters, no significant symptoms of the political cycle are observed in terms of tax policy at the local level [Swianiewicz & Łukomska, 2015, pp. 275]. The progressive decentralisation of powers and the entrustment of additional tasks to local governments mean that some signs of a cycle are present in the setting of local tariffs: water and sewage tariffs, rents in municipal housing, tickets for local public transport, parking fees, or rubbish collection rates [Swianiewicz & Kurniewicz, 2018]. In turn, the increase in budget spending in election years was identified as an important factor increasing the chance of winning elections [Kukułowicz & Górecki, 2018]. An increase in spending on local government employees' salaries in pre-election periods as a symptom of the occurrence of a local political business cycle in Polish districts and provinces was identified in a study conducted by Ł. W. Olejnik. There, it was pointed out that expenditure on salaries is higher in districts with a dominant grouping with high coalition strength

[Olejnik, 2019]. The author of the research took into account an important factor in creating the political business cycle, which is the fact that the final shape of the budget is determined by the relations between the executive and the legislative bodies of local government.

The phenomenon of the political business cycle at the local level in Poland has not yet been thoroughly recognised, especially in the cross-section of municipalities into urban and urban-rural gminas. On the basis of Nordhaus's theory, which assumes that voters have a "short memory", and due to the fact that the population living in rural areas may be less familiar with the meanders of public finance and the relationship between municipal authorities and voters is more direct than in urban municipalities, it is worth making an attempt to identify and measure the positive impulse on the formation of budget expenditures in election years as a symptom of the existence of a political cycle in urban, urban-rural and rural municipalities. This article is an attempt to partially fill this research gap in Poland.

Methodology

In order to identify and measure the impact of the electoral period on the total expenditure of municipalities in Poland, the GRETL software was used to estimate econometric models of time series using the Generalised Least Squares Method, specifically the Cochrane-Orcutte procedure which corrects for the presence of autocorrelation of the random component [Maddala, 2006, pp. 279-281]. This method has an advantage over the Classical Least Squares Method, because in the case of autocorrelation of the random component, which often happens in time series, it does not "artificially" inflate the values of Student's t statistics [Borkowski, Dudek & Szczęsny, 2004, pp. 114], on the basis of which the statistical significance of the explanatory variables of the model is determined. And this, from the point of view of the aims of this article, is of key importance.

On the basis of the CSO data on the implementation of expenditures and revenues of municipalities by urban, urban-rural, the following models were estimated:

$$TE_t = \beta_0 + \beta_1 TR_t + \beta_2 E_t + \eta_t \quad (1)$$

where: TE_t - total budget expenditure in municipalities in millions of PLN in subsequent years; TR_t - total budget revenue in municipalities in millions of PLN in

subsequent years; E_t - election year - a zero-one variable specifying the occurrence of the year in which local government elections are held (1 - election year; 0 - other years) n_t - random component of the model; $\beta_0, \beta_1; \beta_2$ - model parameters.

In the set of explanatory variables, there is a variable representing the level of realised total budget revenues in communes in Poland. In the light of many studies, this is the strongest determinant of budget expenditure in local government units, as the level of expenditure in the budget is planned on the basis of projected income, taking into account the debt limits of local government units in Poland. Until 2013, a debt limit of 60% of total revenue in subsequent years was in force. Since 2014, a debt service limit in the form of an individual debt ratio (from 2018 calculated according to a modified algorithm), calculated by each municipality separately, and the need to obtain an appropriate operating surplus (surplus of current income over current expenditure) have been in force [Dworakowska, 2018, pp. 138-141]. This is the surplus of current revenue over current expenditure plus the budget surplus from previous years and free funds, and from 2018, the operating surplus plus revenues. The preparation of the budget based on projected revenue and the need to meet statutory debt limits make expenditure and revenue highly correlated. Moreover, the income variable also indirectly reflects the impact of the local (own income of municipalities) and national economic situation.

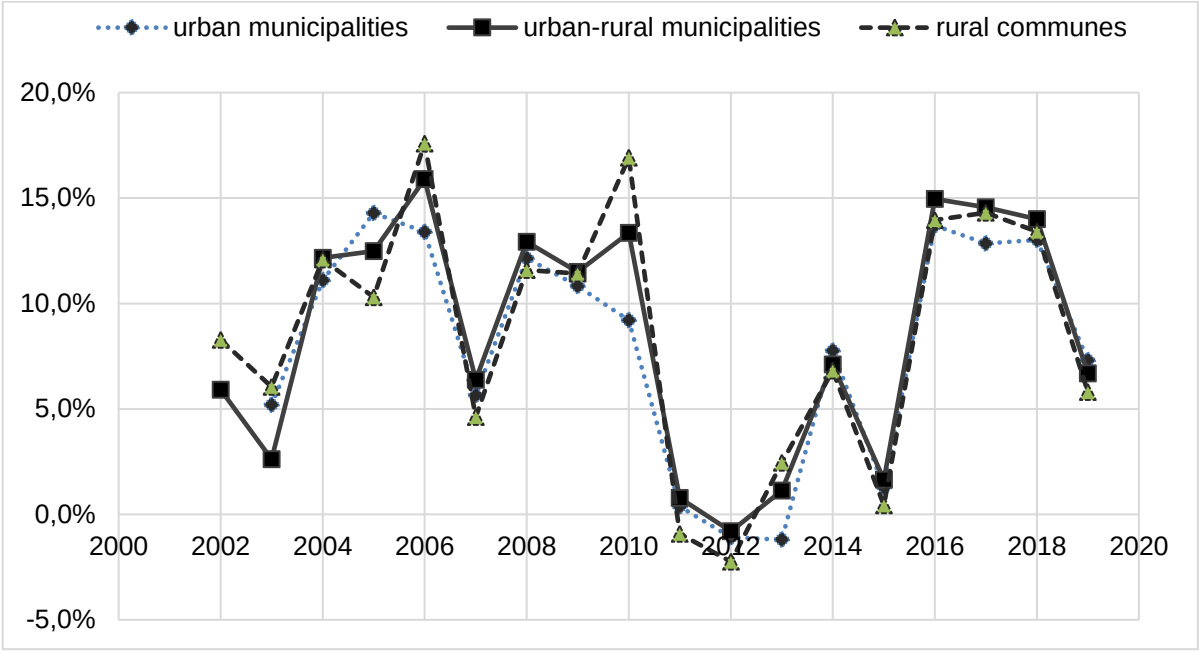
The introduction of a zero-one variable into the model, which takes the value "1" for the years in which local government elections were held and the value "0" for the remaining years, is crucial from the point of view of verifying the hypothesis adopted in the article. The estimated parameter β_2 will make it possible to determine by how much the municipal budget expenditures are on average higher in the election years compared to the remaining years, regardless of what the level of budget revenues in the municipalities is. If the "500 plus" social programme were abolished in Poland in 2023, i.e. in the year of the next local elections, which in itself is perhaps politically unfeasible, then municipal expenditures would decrease not because there is no cycle in municipal budget policy, but because of a decrease in the revenue received from the central budget for the implementation of this social task. Identifying a political cycle on the basis of expenditure dynamics alone is insufficient, as the level of expenditure is primarily determined by budget revenues. Although these revenues are, to a certain extent, also determined by the electoral cycle, when, for example, higher subsidies and grants go to municipalities just before elections.

Statistical significance of the impact of election years on the level of expenditures will be determined by Student's t-test. Since the model of local government expenditures defined by formula (1) will be estimated separately for urban, urban-rural and rural municipalities, the significance hierarchy of the impact of election years on the level of expenditures in this cross-section of municipalities was made on the basis of the "p" value corresponding to the "election year" variables in the estimated models, i.e. the lowest possible significance level for which this variable remains statistically significant [Kufel, 2007, pp. 125-126]. The "p" value is a measure of the probability of an error in inference (the so-called "type I error") and the lower it is, the stronger the statistical significance of the effect of the explanatory variable on the explained variable. In economic research it is assumed that if the "p" value is less than 0.01, then the result of the experiment is highly significant [Aczel, 2004, pp. 308]. On this basis, it will be possible to determine whether the manifestation of the political cycle in budgetary policy studied in the article is more pronounced in rural or urban municipalities.

Results

Based on CSO data on the budgets of local government units in Poland, the dynamics of the level of municipal expenditure in 2001-2019 was examined (Fig.1). Figure 1 confirms the theses of many authors about the occurrence of a politically conditioned expenditure cycle. It can be noted that the rate of change of expenditures in election years, i.e. 2006, 2010 and 2018, is significantly higher compared to other years and amounts to several percent. The exception may be the slightly lower dynamics in 2002 and 2014, which was caused by the weak economic situation in the Polish economy in 2001-2002 and 2012-2013. In 2018, on the other hand, the dynamics of expenditure slowed down a bit after a jump in 2016.

Fig. 1. Total expenditure dynamics of municipalities in Poland in 2002-2019



Source: own calculations based on CSO data.

The strong increase in the level of expenditure in 2016 was due to the start of the "500 plus" social programme in Poland. Municipalities received a large cash injection from the central budget for the implementation of this programme. Thus, the significant increase in expenditure in 2016 was mainly due to an increase in municipalities' income. Moreover, after periods of jumping growth, there was a significant slowdown in expenditure dynamics in the first years of the term.

It seems crucial, however, to determine whether the increase in expenditure in election years is the result of political determination of local authorities to be re-elected or whether it results only from an increase in the level of municipal income recorded in the period under study. For this purpose, econometric time series models of expenditures in municipalities were estimated, which in the set of explanatory variables, include variables representing economic (income) and political (election year) factors. The estimated models of total expenditure in the cross-section of urban, urban-rural municipalities (Table 1) are characterized by very high coefficients of determination of over 99%. This means that they explain in almost 100% the general variability of total expenditure in the studied cross-sections of municipalities. Thanks to the application of the Chochrane-Orcutte procedure, no autocorrelation and hetreskedasticity of the random components of the models were

found. Both explanatory variables in the models are statistically significant at the significance level of 0.05 ("p" values below 0.05).

Table 1. Estimated regression models of total expenditure of municipalities in Poland for the period 2001-2019

Type of municipality	Estimated model and coefficient of determination	Value of 'p' for the variable 'Election year'.
municipal	$TE_t = -339{,}650 + 1{,}015TR_t + 559{,}472E_t$ $R^2 = 0{,}995$	0,025
urban-rural	$TE_t = 34{,}664 + 1{,}004TR_t + 895{,}145E_t$ $R^2 = 0{,}996$	0,007
rural	$TE_t = -389{,}822 + 1{,}009TR_t + 1392{,}64E_t$ $R^2 = 0{,}995$	0,006

Source: own calculation on based GUS data.

The estimation of the parameter next to the "total income" variable shows that an increase in total income by PLN 1 million results in an increase in expenditures by about PLN 1.015 million on average in urban gminas, by about PLN 1.004 million in urban-rural gminas and by about PLN 1.009 million in rural gminas. This means that municipal budgets are relatively balanced in the long term. On this basis, it can also be concluded that the statutory debt limits in force in the period 2001-2019 are effective, although there are cases of failure to meet them in Poland on the scale of individual municipalities.

The statistical significance of the variable "election year" and the positive value of the estimated parameter next to it confirm that in election years there is an impulse in the municipalities' budgetary policy to increase expenditures, which is independent of the level of total revenue. In election years total expenditures are on average higher by about PLN 559.472 million in urban municipalities, by about PLN 895.145 million in urban-rural municipalities and by about PLN 1,392.64 million in rural municipalities compared to expenditures in other years and regardless of the level of total revenue. It can be stated that this impulse is stronger in the case of rural than urban gminas, however it is due to the effect of scale, as rural gminas in Poland constitute approx. 80% of the total number of gminas in Poland. A confirmation of a more significant impulse to increase total expenditures in election years in rural gminas in relation to urban and urban-rural gminas is the lowest in the examined cross-section "p" value of the variable "election year" in the model for rural

gminas (the third column of Table 1). It amounts to only 0.006, which means that the examined symptom of the political cycle in rural municipalities is highly significant. The situation is similar in urban-rural municipalities, where the "p" value of the zero-one variable is equal to 0.07. On the other hand, in the expenditure model of urban municipalities, the value is 0.025. This means that in the case of testing the significance of the variable "election year" at the significance level equal to 0.01, this variable would turn out to be a non-significant variable. On this basis, it can be concluded that the studied impulse of the political business cycle on the development of total expenditure is stronger and more significant in rural than in urban municipalities.

As far as the study of the formation of current expenditure is concerned, in the light of the estimates presented in Table 2, it should be unequivocally stated that the variable "election year" in each cross-section of municipalities is statistically insignificant (the third column of Table 2). The "p" values are very high for this variable and amount to more than 0.5. Therefore, in conclusion,the examined symptom of the political cycle in terms of the formation of current expenditure in municipalities in Poland in the period 2001-2019 did not occur. The very high level of determination coefficients of these models and the statistical significance of the variable "total income" allow us to conclude that current expenditure is very much determined by municipal income. This was also confirmed by additional estimations of the models after removing the variable "election year" from them. And although the results of Ł. W. Olejnik's research confirm the phenomenon of the political cycle in terms of expenditure on remuneration, an additional, because "non-revenue", impulse to increase current expenditure was not recorded in this study.

Table 2. estimated regression models of current expenditure of municipalities in Poland for the period 2001-2019

Type of municipality	Estimated model and coefficient of determination	Value of 'p' for the variable 'Election year'.
municipal	$TE_t = -21{,}371 + 0{,}835I_t + 51{,}733E_t$ $R^2 = 0{,}993$	0,658
urban-rural	$TE_t = -385{,}577 + 0{,}849I_t + 141{,}795E_t$ $R^2 = 0{,}998$	0,518
rural	$TE_t = -759{,}926 + 0{,}839I_t + 43{,}222E_t$ $R^2 = 0{,}996$	0,904

Source: own calculation on based GUS data.

On the other hand, in terms of property expenditures, the impulse to increase them was noted in each cross-section of municipalities. However, the variable "election year" is statistically significant at the level of significance slightly above 0.07 in models estimated for urban and urban-rural gminas. In rural municipalities, the phenomenon is significant at a lower significance level of 0.045, which also confirms the regularity observed in the total expenditure models that the "more rural" the municipality, the more pronounced the symptom of the political cycle in budgetary policy (column three of Table 3).

Table 3. estimated regression models of property expenditure of municipalities in Poland for the period 2001-2019

Type of municipality	**Estimated model and coefficient of determination**	**Value of 'p' for the variable 'YEAR OF ELECTION'.**
municipal	$TE_t = -421{,}477 + 0{,}185I_t + 453{,}686E_t$ $R^2 = 0{,}784$	0,070
urban-rural	$TE_t = 494{,}211 + 0{,}153I_t + 748{,}483E_t$ $R^2 = 0{,}811$	0,060
rural	$TE_t = 449{,}690 + 0{,}168I_t + 1290{,}450E_t$ $R^2 = 0{,}774$	0,045

Source: own calculation based on GUS data.

Approximately 77-81% of the total variability of property expenditures was explained by the estimated models, which indicates good adaptation of the model to the empirical data. The estimated parameters of the variable "total income" mean that with an increase in total income by PLN 1 million, the property expenditures increase on average by about PLN 185 thousand in urban gminas, by about PLN 153 thousand in urban-rural gminas, and by about PLN 168 thousand in rural gminas. Relatively lower growth of property expenditures as a result of the increase of total revenue results from the fact that property expenditures constitute a small percentage of total expenditures of municipalities in Poland (approx. 16-18%). The impulse for the increase of property expenditures in election years in urban gminas amounts to about PLN 453,686 million, in urban-rural gminas about PLN 748,483 million, and in rural gminas about PLN 1,290.45 million, irrespective of the level of total revenue and in comparison with other years.

As part of additional calculations, the models specified in formula 1 were also estimated with the addition of a third explanatory variable, a zero-one variable taking the

value of 1 for years preceding election years (the value 0 for the others). These variables turned out to be statistically insignificant, indicating that the political impulse to increase spending in municipalities occurs only in years in which elections are held. This observation is consistent with the assumption of Nordhaus' theory that voters have a short memory and adaptive expectations, i.e. they extrapolate the performance of candidates in elections based on their achievements observed in the election year.

Summary

On the basis of the analysis carried out, the validity of the research hypothesis can be confirmed. At the local level in Poland, namely in communes, there are symptoms of political business cycle which consist in increasing the level of expenditures in the election year and then slowing down its growth dynamics in the first year of the next term. As a result of the research carried out, it was found that in election years there is an impulse to increase spending by local governments regardless of the level of budget revenues. This impulse is stronger and more significant in rural municipalities than in urban and urban-rural ones. Explaining this on the basis of Nordhaus's political cycle theory, it may be assumed that voters in rural areas have a "shorter memory" and judge politicians on the basis of the current situation in their municipalities rather than the entire term of office. In turn, politicians seeking re-election try to make effective use of this by increasing spending, mainly investment spending, in the last year of their term. The political effectiveness of such fiscal policies in rural municipalities may also result from the fact that relations between local authorities and voters are more direct and less anonymous in rural areas than in urban municipalities. In addition, this phenomenon may also result from less economic knowledge of the rural population and less interest in the shape and details of fiscal policy in municipalities.

The separation of the political cycle from the course of the economic cycle in the economy forces questions about the economic rationality (not political) of such and not such fiscal policy in municipalities in Poland. The rational counter-cyclicality of fiscal policy, which means, among other things, that it is reasonable to create budget surpluses in periods of economic prosperity, which could constitute a budget reserve in case of a decline in revenues during the crisis [Owsiak, 2011, pp. 182-183], may not be feasible due to the existence of the electoral cycle. Nevertheless, a positive development is the fact noted in the

study that the political business cycle concerns investment spending and not current spending, as investment is the engine of the economy. However, the question of their effectiveness requires deeper study, so it is also important to examine the structure of these expenditures. Are these investments which generate additional income for the budget in the future or are they rather of a nature to "beautify" local infrastructure? Are these investments responding to the needs of the local community or are they rather conditioned by the possibility of obtaining co-financing from the EU funds (municipalities may decide not necessarily to undertake investments that are needed by the local community, but rather investments that can be co-financed in a given perspective from the EU budget).

The progressing decentralisation of public finance in Poland and changes in the principles of fiscal policy at the local level, the ongoing pandemic, the extension of the electoral cycle from four to five years and the introduction of a limit of two consecutive terms of office in local government elections justify the need for further research into the local political business cycle. Moreover, this research requires an interdisciplinary approach, as confirmed, among others, by the observation of C. E. Walsh [2000, p. 134] that while econometric time series analysis is an excellent tool for hypothesis testing, it is sometimes the tools of historians rather than econometricians that are more effective in fully understanding the political and electoral aspects of economic policy.

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Models of human resource nutrition and health: exploring the relationships

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Abstract. The paper examines the relationship between the nutrition models according to the locations (at home and out-of-home) and formats (restaurants, canteens, buffets/cafeterias, etc.), nutrition structure (consumption of basic staples) and health and mortality of the population of Poland and Ukraine. The conducted research allowed determining the importance of these elements in the social and economic development of the countries. The authors identified common and different features in the models of meal arrangements and household eating behaviour. The scholars also analysed the structure and performance of the food business of both countries and clarified its infrastructural and economic features. The research determined that the lack of effective demand in Ukraine does not stimulate food business development of in the catering sector, however, in turn, has long-term consequences for morbidity and mortality of the population. The authors investigated morbidity and mortality from the most common diseases and found that the morbidity rate in Ukraine is higher, and deaths from ischaemic heart disease, also called coronary heart disease (CHD), infectious and parasitic diseases is 6 times higher, whereas mortality from cerebrovascular and circulatory system diseases is 2 times higher than in Poland. The paper found and interpreted dependences between household expenditures on food for different models of meal arrangements, development and health of human resources. The scholars established that household expenditures on eating at home and out-of-home do not have a significant impact on the morbidity of the population in both countries. The performance of public catering companies (their revenue) causes a slight increase in obesity of human resources. Food consumption by human resources and the spread of morbidity in both countries are also poorly linked. However, the study revealed that there are food groups in both countries whose consumption is associated with increased mortality. Such staples as sugar, bread and bakery products were common to both countries. The authors found that food business development via increasing household expenditure on food in the catering sector and increasing the revenue of catering companies contribute to a slight mortality reduction in Ukraine, while in both countries increasing household spending on food prevents increased mortality from malignant neoplasms.

Key words: models, business, nutrition, morbidity, mortality, consumption, health, human resources.

JEL: C 13, D12, I12, L83, O15

Introduction

The health of human resources is one of the indicators of the social and economic development of the state. It is a public good and not only individual. Therefore, its support and provision is built by states taking into account global regulatory and institutional developments, in particular the Agenda for Sustainable Development (2015), recommendations of the World Health Organization and domestic policy of states, in particular the Presidential Decree "On the Sustainable Development Goals of Ukraine until 2030" (2019) and the reference document of the Polish Ministry of Economic Development, Labour and Technology (2018).

The experts of the World Health Organization estimated that 50% of a person's physical health status is determined by his/her lifestyle (primarily by the nature of diet, bad habits, and working conditions), 20% by environmental factors, another 20% by genetic predisposition and only 10% by the medical care.

Modern research on the relationship between nutrition and health covers t he following areas: quality of food, social and economic effects of nutrition and its functional aspect – models of food organization.

The Food and Agriculture Organization of the United Nations (2017) identifies the problem of poor-quality diets, which causes two major issues: either hunger due to lack of food (like in African countries), or overweight and obesity due to micronutrient deficiencies. Here we can highlight the current problem of the study relationship between food consumption and morbidity and mortality of human resources.

The relationship between the food quality, social and economic characteristics of human development is studied in [Afshin, Sur et al.,2019 and Bloom Cafiero, Jane-Llopis et etc., 2011]. Ashkan Afshin, Christopher J. L. Murray, Patrick Sur et al. [Afshin, Sur et al.,2019] found that every fifth death in the world occurs precisely because people do not eat healthy food. In addition to mortality, poor diet affects the DALYs (Disability-Adjusted Life Years), years of life lost due to premature mortality, disability or time lived in states of less than full health. 255 million years of healthy life are lost due to poor diet: this is 16% of DALYs among adults worldwide.

According to the report of the World Economic Forum and Harvard University [Bloom, Cafiero, Jane-Llopis et etc., 2011], mortality from major non-communicable diseases leads

to a total loss in output, which is equivalent to about 5% of annual global GDP. In addition, due to the high morbidity of the employed population, especially due to non-adherence to a healthy lifestyle, the total loss of productivity in 2010-2015 amounted to 5.4% in China and 8% of GDP in the United States.

M. Marmot & R. Wilkinson [Marmot, Wilkinson, 2006], Morrison G. [Morrison, 2009], Raphael D [Raphael, 2009], and Shushpanov D [Shushpanov, 2016] position diet as a social and economic determinant of health, while emphasising the link between food (i.e. nutrition) and household income. David E. Bloom proves that this relationship is reciprocal, as "Countries with higher incomes tend to have healthier populations, traditionally seen as the result of the superior nutrition and the better access to safe water, sanitation, and health care that higher income brings" [Bloom, 2014, pp. 6]. However, not has been installed the causation for specific states in these studies.

The functional aspect of nutrition is that it is a primary, physiological need that human resources to satisfy either at home or outside the home through the food business. In fact, business forms models of the organization of food of human resources both on a place, and on channels of coverage of consumers. At the same time, the public organization of food gives the right to human resources to satisfy the needs of the highest level, namely secondary in communication and communications. In this context, it is interesting to find links between the nutrition models and human health.

Gheribi E. [Gheribi , 2016] identifies a number of factors, including lifestyle changes, income growth, employment diversification, and reduced leisure time, that contribute to the breakaway from the traditional model of eating at home and give impetus to the food business, including the catering industry and complementary cooking and delivery services, which may also vary in quality and price. E. Figee & M. Oortwijn [Figee, Oortwijn, 2004], as well as B.Kowrygo & D.Stangierska [Kowrygo, Stangierska, 2012], identify five main channels of consumer coverage in the catering industry: catering entities, restaurants, retail, vending and entertainment companies. However, they have not investigated the relationship between these consumer outreach channels and human health.

Therefore, the overall objective of our research is to find the relationships between the models of nutrition or, in other words, diet (at home and out-of-home (business models)), food quality (consumption of basic staples) and health of the population using the case study of Ukraine and Poland.

Methodology

We conducted a correlation and regression analysis to establish the relationship between the diet models, the structure of nutrition and morbidity of the population, which includes the following stages:

- correlation analysis to establish the significance of relationships between factors,
- regression analysis – to establish causal relationships between the resulting (y) and input (x) factors.

The input indicators include publicly available statistical data regarding consumer expenditure on food and non-alcoholic beverages (eating at home) and out-of-home consumption of food and drinks (expenditure on catering or eating out), consumption of basic staples by the population, the amount of revenue received by 'catering services', i.e. restaurants, cafés, canteens, and the like. The results include the indicators of the incidence of various diseases (prevalence of obesity, diseases and disorders of the musculoskeletal system and connective tissue, diseases of the respiratory system, digestive organs, mental and behavioural disorders, trauma and poisoning, cerebrovascular disease, ischaemic (coronary) heart disease, infectious and parasitic diseases).

The adequacy of the obtained regression equations was checked by Fisher's test, and the significance of the regression coefficients was assessed by Student's test using MS EXCEL software. For economic and mathematical analysis of the obtained regression dependences, the average coefficients of elasticity of the indicators that affect the resulting indicator are calculated by the formula:

$$\mathrm{Ex}_n = k_n \frac{\overline{x_n}}{\bar{y}}$$

where Exn –the calculated value of the average coefficient of elasticity of the studied indicator,

kn – the value of the regression coefficient of the studied factor,

$\overline{x_n}$ –the average value of the studied factor,

$\bar{y}$ –the average value of the resulting factor

The information base of the study was the statistical data of the Statistics Poland (formerly known in English as the Central Statistical Office, popularly called GUS) and the State Statistics Service of Ukraine on the number and structure of catering services' network and their revenues, household income and expenditure, consumption of basic staples and data

of the WHO Regional Office for Europe on morbidity and mortality (Appendix A, B). Given that publicly available statistical information on different indicators in Ukraine and Poland is presented for different time periods, the study takes into account the data that is available since 2000. There are also peculiarities in the collection and presentation of statistical data regarding the incidence of diseases among population in both countries, therefore the study selected the data, which are common to both countries. In view of the above, we have further investigated the relationship between the aforementioned indicators and mortality from various diseases.

Result

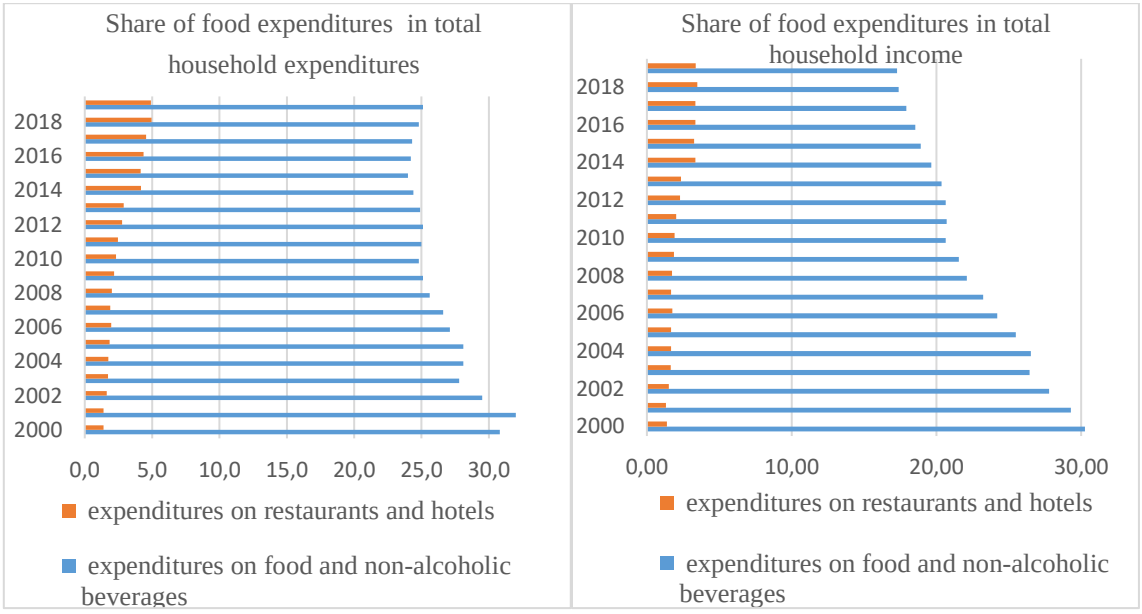
Household Eating Behaviours

Ukraine and Poland are neighbouring countries with different levels of social and economic development, however with common historical and cultural traditions of particular territories. In recent years, there has been a shift in emphasis with regard to nutrition/diet in both countries. Increase in the quality of life and the growth of household incomes are driving the changes in eating habits: traditional home cooking and family consumption have increasingly been replaced by cooking and eating out, in catering establishments. For instance, in Poland, although over 20 years household expenditures on eating at home (statistical indicator: expenditures on food and non-alcoholic beverages) increased by 70% from 184.77 Polish złoty (PLN) in 2000 to PLN 314.35 in 2019, in the structure of total household expenditures the indicator decreased by 5.7 percentage points from 30.8% to 25.1%, respectively, and its share in the income accounted for 30% in 2000 and 17.3% in 2019, respectively. Expenditures on eating out (statistical indicator: expenditures on restaurants and hotels) increased from PLN 8.41 to PLN 61.41 per capita and accounted for 1.4% to 4.9% of household expenditures, respectively, and their shares in the income structure were 1.38% and 3.48%, respectively (see Fig. 1).

In Ukraine, one can easily note the changes in the amount and share of food expenditures at home, as they are even more evident. In absolute terms, expenditures on food and non-alcoholic beverages increased 13 times, however, the percentage of the indicator decreased from 64% in total expenditures (82% in total household income) in 2000 to 46.6% in 2019 (37.2% in total income). Expenditures on eating out (indicator: expenditures

on restaurants and hotels) increased from 5 Ukrainian hryvnias (UAH) to UAH 251 (from 1% of total household expenditures in 2000 to 2.6% in 2019) and relative to income it amounted to 1.2 % and 2.1% respectively (see Fig. 2).

Figure 1. Dynamics of Household Food Expenditure at Home and Away From Home in total Household Expenditures and Incomes (Poland)



Source: own elaboration based on the data of Statistics Poland (GUS)

Figure 2. Dynamics of Household Food Expenditure at Home and Away From Home in total Household Expenditures and Incomes (Ukraine)

Source: own elaboration based on the data of State Statistics Service of Ukraine

We should also underline that household consumption of food in Ukraine is higher than in Poland. In 2019, compared to 2000, the consumption of meat and meat products (+1.8 kg/month per person), milk and dairy products (+1.9 kg), fruit (+1.5 kg) increased significantly slightly, while for eggs (+2 pcs) and fish (+ 0.2 kg) the consumption slightly increased. Consumption of potatoes (-4.2 kg), bread and bakery products (-2.6 kg), sugar (-0.9 kg) and vegetables (-0.7 kg) decreased. If we look at Poland, in 2019, compared to 2003 (years for which the statistical information is available), the consumption of all food products is declining. The research noted the highest decline for vegetables (-5.06 kg), bread and bakery products (-3.46 kg) and sugar (0.89 kg), and the least decline rates for fish (-0.14 kg) and fruit (-0.2 kg). The consumption of meat and fruit is approximately the same in both countries (about 5 and 4 kg/month per person, respectively), and the consumption of fish in Ukraine is 5 times higher than in Poland, while in case of sugar it is 2.6 times higher. Potato consumption in Poland is calculated as a separate position starting from 2015, so in our study we took into account the consumption of potatoes together with other vegetables. The caloric content of food in both countries is sufficient and the WHO does not calculate the depth of hunger, or food deficit, for them.

The main reasons for the identified disparities are of ethnic and economic nature. Ukrainians like to eat well, and with increasing incomes, the range of gastronomic preferences is also expanding. Besides, although no one has raised the issue of food waste in Ukraine at the state level yet, as well as in Poland, however it is surely present. On the other hand, for a significant part of the population of Ukraine the income level remains quite low, and therefore eating at home is the prevalent choice. Hence, the lack of effective demand does not stimulate the development of the catering industry.

Catering Industry Overview

Compared to Poland and other European countries, in Ukraine, the network of catering establishments is underdeveloped. For instance, according to studies conducted by G. Anisimov, Y. Zhukov & D. Lipovoy [Anisimov, Zhukov, Lipovoy, 2018] in the countries of Western Europe the indicator of the availability of catering establishments is 32 objects, in the low-income countries the number is 16, in the Republic of Belarus the number is 13, in

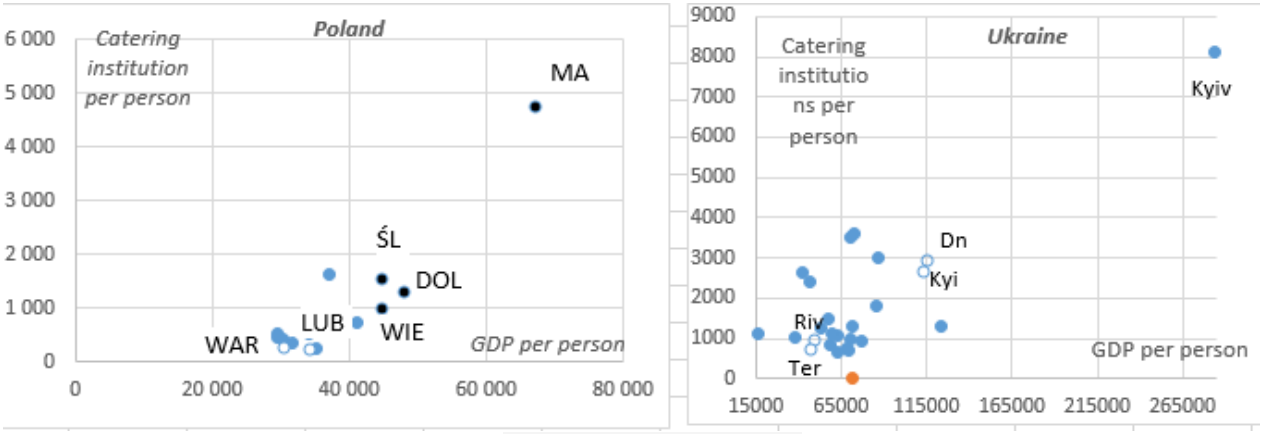
Poland the number is 18, and in Ukraine the number is 11. In Europe, there is one catering establishment per 477 inhabitants, in Poland one per 554, and in Ukraine one per 845 people.

The major business models in the catering industry, for which one can find available statistical information, include restaurants, cafés and bars, canteens, food courts in Poland, as well as snack bars and buffets in Ukraine. In Poland, food courts have the largest share (32%), while the number of canteens is the least. During 2005-2019, the share of restaurants (29-32%) and bars (28-30%) remained relatively stable, the share of food courts increased (from 19% in 2005 to 31% in 2019) and the share canteens halved (from 22% in 2005 to 10% in 2019) (see Appendix A).

If we look at the availability of catering, there is an increase from 9 bars and restaurants per 100 thousand people in 2005 to 15 in 2019, respectively, an increase from 6 to 17 food courts and a decrease from 7 to 5 canteens.

A breakdown into voivodships shows that Masovian (mazowieckie), Lesser Poland (małopolskie), Lower Silesian (dolnośląskie), and Silesian (śląskie) voivodships have the largest number of establishments, while Lubusz (lubuskie), Podlaskie (podlaskie), and Opole (opolskie) voivodships have the smallest number. As a rule, this distribution corresponds to the level of voivodship development in terms of GDP per capita (see Fig. 3).

Figure 3. Distribution of the Regions of Poland and Ukraine by the Number of Catering Establishments and GDP Per Capita



Source: own elaboration based on the data of Statistics Poland (GUS) and State Statistics Service of Ukraine

In Ukraine, cafes, snack bars, buffets, and canteens dominate in the structure of catering establishments, while restaurants are the least numerous ones. During 2010-2017, the share of restaurants increased from 6% to 8.9%, for canteens it increased from 43%

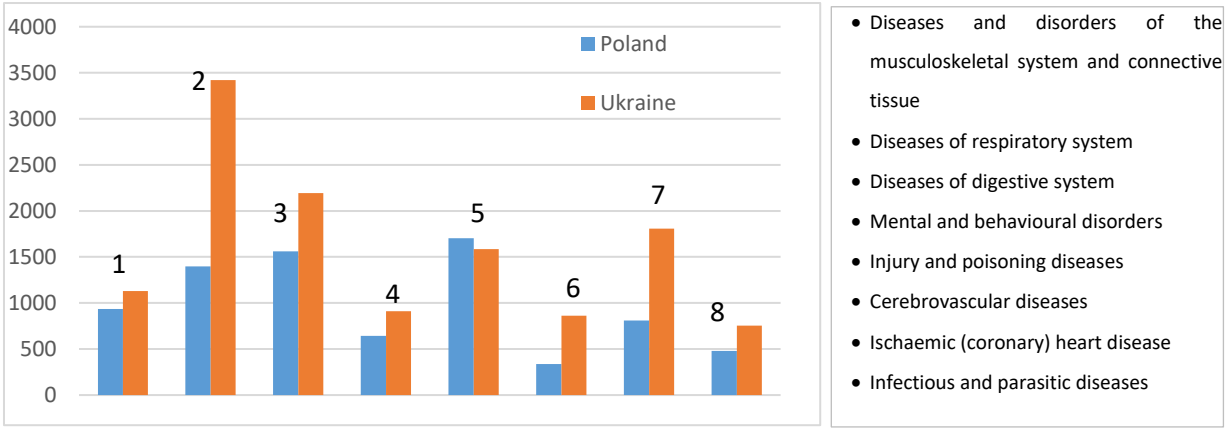
to 50.4%, and the share of cafes, snack bars and buffets it decreased from 40% to 30%, the share of bars remained unchanged, namely 10% (see Appendix A). As in Poland, the regional distribution of caterers generally corresponds to the level of their development in terms of GDP per capita. Most catering establishments are located in the capital (Kyiv), Dnipropetrovsk and Kyiv Oblasts (regions), Ternopil and Rivne Oblasts have the smallest number of caterers (see Fig.3).

The growth of household expenditures on eating out and the growth of revenues of catering establishments occurred at different rates, nonetheless the increase in absolute amounts in 2019 compared to 2005 in Poland is higher according to the expenditures on eating out, whereas in Ukraine – according to the revenues of catering establishments.

Morbidity and Mortality Rate

Statistics from the WHO Regional Office for Europe show that the population of Ukraine is in worse health than people in Poland. In terms of the prevalence of diseases (per 100,000 population), Ukraine is ahead of Poland in all studied indicators. The foremost differences between the countries are in the number of respiratory and cerebrovascular diseases (more than 2 times), the number of injuries and poisonings are almost at the same level (see Fig. 4).

Figure 4: Population Morbidity in Ukraine and Poland, 2009



Source: own elaboration based on the data of Statistics Poland (GUS) and State Statistics Service of Ukraine

Poland, deaths from respiratory diseases, diabetes, endocrine, food and metabolic diseases, malignant neoplasms, mental disorders and diseases of the nervous system and sense organs are higher. Nevertheless, in Ukraine mortality from ischaemic (coronary) heart

disease, infectious and parasitic diseases is 6 times higher than in Poland, and death rate from cerebrovascular and circulatory diseases is 2 times higher than in Poland. The countries have approximately the same mortality rate from blood diseases (see Appendix B).

Finding Relationships

The correlation and regression analysis, which we conducted for Poland on the basis of data for seven years (2003 – 2009), showed the presence of strong relationships (correlation coefficient r ≥0.85) in two cases: for all input indicators (forms of nutrition/diet, revenues of catering establishments) and the prevalence of obesity, as well as household expenditures on food and musculoskeletal diseases. The analysis found causal links only between the revenues of catering establishments and the prevalence of obesity (see Appendix C). An increase in the revenue of catering establishments by 1% causes an increase in the prevalence of obesity among persons over 18 years of age by 0.09%, which indicates the average coefficient of elasticity of a statistically significant factor.

We should emphasize that in Ukraine, as in Poland, the links between inputs and morbidity are not very noticeable. The correlation and regression analysis, which we conducted on the basis of statistical data for eleven years (2005 – 2015), showed the presence of strong correlations between all inputs and the prevalence of obesity, as well as household expenditure on food and non-alcoholic beverages and mental and behavioural disorders, injuries and poisonings, infectious and parasitic diseases. Conversely, we found insignificant causal links only between household expenditures on eating out and the revenues of catering establishments and the prevalence of obesity. Therefore, by the values of the average coefficients of elasticity, an increase in household expenditures on eating out by 1% may lead to an increase in the prevalence of obesity by 0.07%, and by 0.02% in revenues of catering establishments.

Food consumption by the population and the estimated morbidity cases in both countries are also poorly linked. The reasons may include the objective lack of a statistically significant relationship, the need in longer study period (7 years for Poland and 11 years for Ukraine may be insufficient) and unaccounted facts of disease when people do not consult a physician.

In case of Poland, we found strong correlations between the consumption of fish, sugar, vegetable oil and fats, vegetables, bread and bakery products and the prevalence of obesity. The study revealed that significant correlations ($r \geq 0.75$) exist between fish and egg consumption and musculoskeletal diseases, milk and dairy consumption and cerebrovascular diseases, fruit consumption and ischaemic (coronary) heart disease. Nonetheless, there are no causal relationships between food consumption and morbidity of the population for studied diseases (see Appendix D).

The situation in Ukraine is somewhat different. The analysis revealed significant ($r \geq 0.75$) and strong correlations ($r \geq 0.85$) between the consumption of fish and fish products by the population and the prevalence of obesity, digestive diseases, mental and behavioural disorders, injuries and poisonings; consumption of meat, fruit, berries, nuts, grapes and cerebrovascular diseases and ischaemic (coronary) heart disease; consumption of potatoes, bread and bakery products and the prevalence of obesity, digestive diseases, injuries and poisonings, mental and behavioural disorders. We established a causal relationship between the prevalence of obesity and the consumption of fish and fish products, sugar and potatoes, as well as the consumption of fish and potatoes and the growth of mental and behavioural disorders. Hence, an increase in fish and potato consumption by 1% can lead to a decrease in the prevalence of obesity by 0.1 and 0.56%, respectively, while an increase in sugar consumption may lead to an increase in the prevalence of obesity by 0.38%. If the consumption of other foods remains the same, an increase in the consumption of fish and fish products by 1% can lead to an increase in mental and behavioural disorders by 0.76%, and an increase in the consumption of potatoes can lead to a corresponding increase by 1.8%. The presence of contradictory, from the point of view of nutrition, relationships (including causal ones) between the consumption of fish and fish products in Ukraine and the increase in morbidity may indicate the inadequate quality of these products, associated not only with the quality of raw materials, but also with the subsequent process of its processing, transportation and storage.

If we consider the impact of the same inputs on mortality rates, we can state that it is surely more pronounced (see Appendix E). In Poland, the form of catering and the revenue of catering establishments are not related to mortality from respiratory diseases, diabetes, endocrine diseases, infectious and parasitic diseases, mental disorders and diseases of the nervous system and sense organs. On the other hand, an increase in household expenditures

on food and non-alcoholic beverages by 1% can reduce mortality from cerebrovascular diseases by 0.44%, and mortality from malignant neoplasms by 0.47%. In its turn, a 1% increase of household expenditures on restaurants and hotels may lead to the reduction in mortality from external injuries and poisonings by 0.12%, and a 1% increase of the revenue of catering establishments may lead to the reduction by 0.17%. A similar increase in the revenue of catering establishments can also help reducing mortality from cerebrovascular diseases by 0.29%.

The study found a strong correlation between the consumption of eggs, sugar, vegetables (including potatoes), bread and bakery products and mortality from cervical cancer, cerebrovascular diseases, circulatory diseases, blood diseases, external injuries and poisonings, ischaemic (coronary) heart disease and malignant neoplasms. It is possible that the consumption of potatoes within the whole vegetable group has such an impact, however in the statistics available for the study period, it is not calculated separately. We also noted a significant causal relationship between the consumption of eggs, oil, bread and bakery products and mortality from cerebrovascular diseases. Consequently, an increase in egg consumption by 1% reduces mortality by 1.51%, and a corresponding increase in consumption of oil, bread and bakery products increases mortality by 47.9% and 95.1% respectively. The analysis also showed that fish consumption increases mortality from infectious and parasitic diseases by 1.36% (see Appendix F).

In Ukraine, correlations and causation are even more tangible. The form of catering and the revenue of catering establishments are not related solely to mortality from cervical cancer and digestive diseases. However, further catering development and increase in household expenditures on eating out (by 1%) can reduce mortality from other diseases considered in the study, aside from the mortality from diseases of the circulatory system and infectious and parasitic diseases, within the range of mortality from 0.15% of malignant neoplasms up to 0.77% in case of mental disorders, diseases of the nervous system and sense organs (see Appendix E).

Our research also revealed strong correlations (correlation coefficient $r \geq 0.85$) between the consumption of sugar, potatoes, bread and bakery products and mortality from the vast majority of the studied diseases, except for cervical cancer, digestive diseases and malignant neoplasms. Nevertheless, the strength of the impact of consumption of these products on mortality shows that other factors that are not taken into account in this study are more

significant. In particular, we found that an increase in population consumption of potatoes by 1% can lead to an increase in mortality from blood diseases by 2.9%, from endocrine diseases by 1.41%, from infectious and parasitic diseases by 1.7%. The analysis also established the causal relationships between milk consumption and mortality from external injuries and poisonings, as well as from mental and behavioural disorders. Hence, according to the findings an increase in milk consumption by 1% can lead to an increase in mortality from external injuries and poisonings by 1.77% and to an increase in mortality from mental and behavioural disorders by 2.94% (see Appendix F).

Summary, recommendations

Achieving the sustainable development goals requires the creation of safe social living conditions for human resources. Satisfaction of the primary physiological human need for food occurs through the use of different models of nutrition/diet in Ukraine and Poland.

Basing on the analysis of food behaviour of households in both countries, the study found that in Poland the expenditures on eating out are higher than in Ukraine. Nonetheless, both countries share similar trends, namely: reduction of food expenditures in the structure of total expenditures with the simultaneous increase in the share of expenditures on eating out, however the pace of the noted tendencies in these countries varies.

The paper analysed nutrition/diet models and the structure of food establishments in Ukraine and Poland for an extensive period. The research found that in both countries there are structural changes in the catering formats. It also revealed that Ukraine lags behind Poland in the level of the availability of catering establishments for human resources.

The study assessed correlation and causal relationships between morbidity, mortality and the structure of human resources in both countries. The analysis established that in Ukraine they are stronger than in Poland, and the level of morbidity and mortality of human resources is higher.

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Appendix A.1

Structure of Catering Establishments and Their Performance Results in Poland

Years	Structure of Catering Establishments				Performance Results of Catering Establishments (Revenue), thou PLN
	restaurants	bars	canteens	food courts	
2005	3,386	3,554	2,640	2,292	7,262,600
2006	3,510	3,793	2,471	2,449	8,156,721
2007	3,673	3,669	2,460	2,506	9,455,252
2008	4,150	3,776	2,077	3,066	10,734,791
2009	4,252	3,817	2,028	3,208	11,961,955
2010	4,625	3,995	2,088	3,700	12,964,888
2011	4,447	3,828	1,898	3,713	13,649,265
2012	4,806	4,266	1,982	4,083	14,719,951
2013	5,264	4,484	1,880	4,179	15,617,247.30
2014	5,615	4,937	1,839	4,934	17,111,889.30
2015	5,587	5,413	1,863	5,748	19,177,590.90
2016	5,917	5,728	1,889	6,089	22,187,755.40
2017	5,600	5,442	1,812	6,271	24,285,734.70
2018	5,034	5,124	1,744	5,798	26,026,718.10
2019	5,837	5,829	2,011	6,583	30,017,103.40

Source: own elaboration based on the data of Statistics Poland (GUS)

Structure of Catering Establishments and Their Performance Results in Ukraine

	Structure of Catering Establishments				Performance Results of Catering Establishments (Revenue), million UAH
Years	restaurants	cafés, snack bars, buffets	bars	canteens	
2010	1,408	9,454	2,453	9,990	10,643,803.8
2011	1,460	9,049	2,448	9,891	11,279,447.2
2012	1,453	8,108	2,266	9,665	16,959,521.8
2013	1,472	7,434	2,146	9,441	22,810,599.1
2014	1,495	6,884	2,063	9,286	17,596,592.6
2015	1,501	6,240	1,931	9,072	22,026,488.6
2016	1,523	5,750	1,842	8,893	27,722,932.6
2017	1,538	5,268	1,748	8,718	36,444,240.5

Source: own elaboration based on the data of Statistics Poland (GUS) and State Statistics Service of Ukraine

Appendix A.2

Household Food Expenditure and Population Morbidity in Poland

Years	Household Food Expenditure, PLN		Population Morbidity, (per 100 000 people)								
	At Home	Away From Home PLN	Revalence of obesity, %	Muscle and connective tissue diseases	Diseases of respiratory system	Diseases of digestive system	Mental and behavioural disorders	Injury and poisoning diseases	Cerebrovascular diseases	Ischaemic (coronary) heart disease	Infectious and parasitic diseases
2003	188	11	18,4	718,56	1417,61	1674,34	623,01	1451,24	370,11	957,89	395,78
2004	195	12	18,8	699,53	1503,67	1711,99	638,7	1562,31	417,37	885,68	424,83
2005	194	13	19,1	598,52	1307,93	1508,41	640,71	1360,76	344,88	773,59	357,71
2006	202	15	19,4	666,88	1333,99	1525,91	635,77	1574,96	355,15	778,39	402,8
2007	216	15	19,8	689	1391,36	1455,69	621,99	1442,74	343,69	742,46	391,25
2008	231	18	20,1	938,12	1516,07	1727,07	673,56	1655,64	387,5	884,2	491,89
2009	240	21	20,5	936,37	1397,41	1560,8	643,69	1701,78	336,42	811,12	477,84

Household Food Expenditure and Population Morbidity in Ukraine

Years	Household Food Expenditure, UAH		Population Morbidity, (per 100 000 people)								
	At Home	Away From Home	Revalence of obesity, %	Muscle and connective tissue diseases	Diseases of respiratory system	Diseases of digestive system	Mental and behavioural disorders	Injury and poisoning diseases	Cerebrovascular diseases	Ischaemic (coronary) heart disease	Infectious and parasitic diseases
2005	695,84	20,90	20,50	1096,02	3149,70	2211,07	937,68	1670,68	770,26	793,96	1645,64
2006	767,57	28,57	20,80	1119,79	3105,34	2210,52	940,89	1698,47	798,47	798,28	1712,21
2007	885,11	39,60	21,10	1139,56	3294,55	2259,77	990,20	1708,51	830,33	785,32	1766,42
2008	1266,71	62,17	21,40	1148,90	3169,65	2250,87	991,64	1681,05	858,87	758,31	1825,24
2009	1377,05	68,85	21,70	1128,37	3419,53	2192,79	910,45	1586,06	862,48	753,28	1808,83
2010	1585,51	73,74	22,00	1145,04	3704,30	2187,41	894,68	1606,76	901,11	756,35	1859,99
2011	1773,95	86,45	22,40	1141,50	3509,60	2139,07	893,57	1563,40	915,81	744,85	1857,64
2012	1799,64	89,80	22,70	1132,74	3238,59	2120,49	840,53	1571,61	916,98	758,28	1866,44
2013	1913,97	95,51	23,00	1132,17	3372,02	2099,16	830,60	1554,25	948,54	746,77	1905,38
2014	2101,38	93,12	23,40	986,64	2840,05	1797,73	662,17	1312,90	817,44	621,97	1621,02
2015	3160,51	119,04	23,70	1050,15	2788,08	1853,77	664,76	1325,57	832,90	630,66	1622,00

Appendix A.3

Household Food consumption in Poland, kilograms

Years	Meat and meat products	Milk and dairy products	Eggs	Fish and fish products	Sugar	Vegetable oil and other vegetable fats	Vegetables (including potatoes) and melon crops	Vruit, berries, nuts and grapes	Bread and bakery products
2003	5,59	6,37	15,16	0,41	1,69	1,61	12,67	3,99	8,82
2004	5,43	0,87	14,89	0,41	1,62	1,57	12,33	3,91	8,68
2005	5,48	6,35	15,16	0,42	1,53	1,53	12,42	3,72	8,44
2006	5,40	6,29	14,02	0,42	1,51	1,46	11,06	3,55	8,05
2007	5,39	6,27	13,49	0,45	1,42	1,42	10,77	3,40	7,70
2008	5,60	6,48	13,05	0,47	1,41	1,39	10,51	3,59	7,42
2009	5,55	6,47	13,00	0,46	1,38	1,37	10,28	3,77	7,17

Household Food consumption in Ukraine, kilograms

Years	Meat and meat products	Milk and dairy products	Eggs	Fish and fish products	Sugar	Vegetable oil and other vegetable fats	Potatoes	Vegetables (including potatoes) and melon crops	Fruit, berries, nuts and grapes	Bread and bakery products
2005	4,4	21,7	21	1,8	3,6	1,9	9,6	9,1	3,1	10,3
2006	4,7	22,3	19	1,9	3,2	1,7	8,7	9,4	3	9,8
2007	5,1	22,1	20	1,9	3,2	1,7	8,3	8,7	3,6	9,6
2008	5,1	22,6	20	2,1	3,4	1,8	8,4	9,3	3,7	9,6
2009	4,8	19,8	20	1,8	3,2	1,9	8	10,1	3,6	9,3
2010	5,1	19,1	20	1,8	3	1,8	7,6	9,5	3,7	9,3
2011	5,1	18,9	20	1,7	3,1	1,8	7,7	10,1	3,7	9,2
2012	5,1	19,6	20	1,7	3,1	1,8	7,6	10,2	3,8	9,1
2013	5,1	20,2	20	1,8	3	1,7	7	9,4	4,2	9
2014	4,9	20,3	20	1,6	3,0	1,7	6,9	9,0	3,7	9,0
2015	4,6	19,8	19	1,2	2,8	1,6	6,6	8,8	3,1	8,5

Appendix B.1

Mortality from Various Diseases in Poland (per 100 000 people)

Years	Diseases of respiratory system	Cancer of the cervix uteri	Cerebrovascular diseases	Diseases of diabetes	Diseases of circulatory system	Diseases of digestive system	Diseases of the blood, blood forming organs and certain immunity disorders	Endocrine, nutritional and metabolic diseases	External causes of injury and poisoning diseases	Infectious and parasitic diseases	Ischaemic (coronary) heart disease	Diseases of malignant neoplasms	Diseases of mental disorders, diseases of nervous system and sense organs
2000	46.42	9.31	104.18	12.97	446.22	37.81	1.41	14.33	66.41	6.47	141.76	217.23	4.06
2001	39.09	8.31	103.6	12.32	433.98	37.67	1.44	13.63	64.09	6.05	134.26	217.84	4.14
2002	37.61	8.41	98.57	12.15	413.88	36.78	1.44	13.47	64.18	6.18	125.78	216.67	3.81
2003	41.46	8.22	95.49	12.24	416.65	36.68	1.31	13.52	62.44	6.09	124.93	214.73	4.34
2004	39.41	8.09	91.54	11.6	397.03	36.42	1.36	13.02	62.14	5.52	117.62	213.98	4.6
2005	42.3	7.81	87.4	12.2	384.24	37.62	1.38	13.45	62.57	5.67	114.43	211.51	4.54
2006	40.67	7.81	83.23	13.12	372.19	39.07	1.06	14.28	61.27	5.66	111.42	210.24	4.9
2007	41.45	8.1	79.79	13.55	365.49	37.73	1.06	14.51	59.77	5.35	104.22	208.72	5.32
2008	40.06	7.31	76.09	13.7	356.9	38.25	0.94	14.74	60.67	6.25	102.32	204.71	5.07
2009	41.91	7.29	72.35	13.69	356.25	38.45	0.92	14.6	57.62	6.31	96.94	201.75	4.27
2010	38.1	7.14	68.46	12.82	335.6	37	0.84	13.64	56.1	6.15	90.29	195.81	3.79
2011	38.48	6.74	66.44	12.95	317.68	34.77	0.66	13.78	55.49	6.66	88.37	191.29	4.29
2012	37.33	6.71	63.01	13.44	323.69	34.73	0.57	14.35	54.26	5.37	83.64	192.32	3.97
2013	41.88	6.5	58.41	13.75	315.02	34.34	0.61	14.6	51.4	4.03	75.07	187.56	3.49
2014	35.85	6.27	53.87	12.18	292.37	33.68	0.44	13.09	48.47	3.86	68.7	187.02	3.38
2015	41.71	5.9	51.53	14.38	302.49	30.88	0.43	15.21	44.34	3.81	68.56	191.53	4.95

Source: own elaboration based on the data of WHO Regional Office for Europe

Appendix B.2

Mortality from Various Diseases in Ukraine (per 100 000 people)

Years	Diseases of respiratory system	Cancer of the cervix uteri	Cerebrovas-cular diseases	Diseases of diabetes	Diseases of circulatory system	Diseases of digestive system	Diseases of the blood, blood forming organs and certain immunity disorders	Endocrine, nutritional and metabolic diseases	External causes of injury and poisoning diseases	Infectious and parasitic diseases	Ischaemic (coronary) heart disease	Diseases of malignant neoplasms	Diseases of mental disorders, diseases of nervous system and sense organs
2000	67.12	7.66	189.86	5.81	789.4	41.91	0.9	8.41	143.37	25.69	504.53	173.15	5.36
2001	59.08	7.48	184.54	5.54	775.16	42.69	0.89	8.39	146.12	25.82	497.81	169	5.15
2002	56.62	7.57	183.59	5.43	799.57	44.77	0.89	8.98	153.17	24.14	516.93	166.9	5.58
2003	53.65	7.37	176.84	4.98	819.59	48.12	0.85	10.4	145.78	25.11	530.82	164.25	5.43
2004	50.65	7.44	177.36	5.39	807.88	54.58	0.82	11.47	143.77	25.88	522.85	162.67	6.47
2005	50.06	7.41	172.21	5.17	827.06	62.04	0.87	6.4	141.16	35.84	543.7	162.47	6.85
2006	44.03	7.28	167.58	4.95	801.63	59.04	0.75	6.1	130.33	33.91	529.44	159.87	5.78
2007	44.66	7.4	166.03	4.53	791.51	65.95	0.78	5.85	133.44	35.02	522.4	158.85	6.09
2008	41.35	7.38	160.24	4.22	781.29	69.17	0.66	5.34	123.94	35.87	516.49	157.28	5.68
2009	36.77	7.54	159.43	4.31	737.58	58.46	0.68	5.1	98.41	31.47	493.45	156.61	4.01
2010	33.5	7.28	148.13	4.02	732.71	51.36	0.58	5.05	88.43	30.41	491.9	156.39	3.17
2011	30.53	7.17	142.19	3.96	682.79	48.03	0.65	4.77	85.09	29.24	459.46	155.87	2.78
2012	29.03	7.46	139.45	3.65	667.11	52.08	0.63	4.71	83.43	28.82	450.07	161.32	2.95
2014	26.76	7.55	126	3.59	673.67	50.13	0.52	4.33	85.42	23.96	457.15	152.99	3.15
2015	25.25	6.86	123	3.61	634.59	45.17	0.57	4.22	73.62	21.67	433.07	144.59	2.5

Source: own elaboration based on the data of WHO Regional Office for Europe

Appendix C

Results of correlation and regression analysis of the impact of nutrition/diet models (at home (x_1), out-of-home (x_2)) and the performance results of catering establishments (x_3) upon the morbidity of the population (y_i) in Poland and Ukraine

Morbidity of the population (per 100 thousand people) (y_i)	Poland				Ukraine			
	Correlation relationship		Regression dependencies		Correlation relationship		Regression dependencies	
	Relationship strength	Factors (x_i)	Statistically significant factors (x_i)	Elasticity coefficient	Relationship strength	Factors (x_i)	Statistically significant factors (x_i)	Elasticity coefficient
Prevalence of obesity (y_1)	>0.95	X_1, X_2, X_3	X_3	+0.09	>0.86	X_1, X_2, X_3	X_1 X_2	+0.07 +0.02
Regression model[*]	$y_1=15,744+2,11E-07x_3$				$y_1=19,78+0,023x_2+3,65E-08x_3$			
Muscle and connective tissue diseases	>0.75<0.85 ≥0.85	X_2 X_1	Statistically insignificant effect		Statistically insignificant relationship and effect			
Diseases of respiratory system	Statistically insignificant relationship and effect				Statistically insignificant relationship and effect			
Diseases of digestive system	Statistically insignificant relationship and effect				>0.75<0.85	X_1	Statistically insignificant effect	
Mental and behavioural disorders	Statistically insignificant relationship and effect				>0.75<0.85 ≥0.85	X_2, X_3 X_1	Statistically insignificant effect	
Injury and poisoning diseases	>0.75<0.85	X_2	Statistically insignificant effect		>0.75<0.85 ≥0.85	X_2 X_1	Statistically insignificant effect	
Cerebrovascular diseases	Statistically insignificant relationship and effect				Statistically insignificant relationship and effect			

Ischaemic (coronary) heart disease	Statistically insignificant relationship and effect			Statistically insignificant relationship and effect		
Infectious and parasitic diseases	>0.75<0.85	X_1, X_2	Statistically insignificant effect	>0.75<0.85 ≥0.85	X_2 X_1	Statistically insignificant effect

Source: own elaboration based on the data of WHO Regional Office for Europe, Statistics Poland (GUS) and State Statistics Service of Ukraine

Legend:

X_1 - Household Expenditures on Eating at Home

X_2 - Household Expenditures on Eating Out

X_3 - Performance Results of Catering Establishments

***** Here and further, the regression dependences are given in the final version after checking the adequacy of the model (Fisher's test) and regression coefficients (Student's test).

Appendix D

Results of correlation and regression analysis of the impact of consumption of food staples by households of Poland and Ukraine (x_1) upon the morbidity of the population

Morbidity of the population (per 100 thousand people) (y_i)	Poland				Ukraine			
	Correlation relationship		Regression dependencies		Correlation relationship		Regression dependencies	
	Relationship strength	Factors (x_i)	Statistically significant factors (x_i)	Elasticity coefficient	Relationship strength	Factors (x_i)	Statistically significant factors (x_i)	Elasticity coefficient
Prevalence of obesity (y_1)	>0.92	X_3, X_4, X_5, X_6, X_7, X_9	Statistically insignificant effect		>0.75<0.85 ≥0.85	X_4 X5, X_9, X_{10}	X_4 X_5 X_{10}	-0.10 +0.38 -0.56
Regression model	x				$y_1=28,24-1,27x_4+2,69x_5-1,58x_{10}$			
Muscle and connective tissue diseases (y_2)	>0.75<0.85	X_3, X_4	Statistically insignificant effect		Statistically insignificant relationship and effect			
Diseases of respiratory system (y_3)	Statistically insignificant relationship and effect				Statistically insignificant relationship and effect			
Diseases of digestive system (y_4)	Statistically insignificant relationship and effect				>0.75<0.85 ≥0.85	X_{10} X_4	Statistically insignificant effect	
Mental and behavioural disorders	Statistically insignificant relationship and effect				>0.75<0.85 ≥0.85	X_9, X_{10} X_4	X_4 X_{10}	+0.76 +1.8
Regression model	x				$y_1=-76,39+300,1x_4+53,31x_{10}$			

Injury and poisoning diseases(y_6)	Statistically insignificant relationship and effect			>0.75<0.85	X_4, X_9, X_{10}	X_4	+0.45
Regression model	x			*y_1=106,8+434,32x_4*			
Cerebrovascular diseases (y_7)	>0.75<0.85	X_2	Statistically insignificant effect	>0.75<0.85	X_1, X_8	Statistically insignificant effect	
Ischaemic (coronary) heart disease (y8)	>0.75<0.85	X_8	Statistically insignificant effect	>0.75<0.85	X_1, X_8	Statistically insignificant effect	
Infectious and parasitic diseases (y_9)	Statistically insignificant relationship and effect			>0.75<0.85	X_4, X_9, X_{10}	Statistically insignificant effect	

Source: own elaboration based on the data of WHO Regional Office for Europe, Statistics Poland (GUS) and State Statistics Service of Ukraine

Legend:

X_1 - household consumption of meat and meat products

X_2 - household consumption of milk and dairy products

X_3 - household consumption of eggs

X_4 - household consumption of fish and fish products

X_5 - household consumption of sugar

X_6 - household consumption of vegetable oil and other vegetable fats

X_7 - household consumption of vegetables and melon crops (for Poland, including potatoes)

X_8 - household consumption of fruit, berries, nuts and grapes

X_9 - household consumption of bread and bakery products

X_{10} - household consumption of potatoes (for Poland it is not calculated separately)

Appendix E

Results of correlation and regression analysis of the impact of nutrition/diet models (at home (x_1), out-of-home (x_2)) and the performance results of catering establishments (x_3) upon the mortality of the population (y_i) in Poland and Ukraine

Mortality of the population (per 100 thousand people) (y_i)	Poland				Ukraine			
	Correlation relationship		Regression dependencies		Correlation relationship		Regression dependencies	
	Relationship strength	Factors (x_i)	Statistically significant factors (x_i)	Elasticity coefficient	Relationship strength	Factors (x_i)	Statistically significant factors (x_i)	Elasticity coefficient
Diseases of respiratory system (y_1)	Statistically insignificant relationship and effect				≥0.85	X_1, X_2	X_2	-0.65
Regression model	x				$y_1=53,45-0,35x_2$			
Cancer of the cervix uteri (y_2)	≥0.85	X_1, X_2, X_3	Statistically insignificant effect		Statistically insignificant relationship and effect			
Cerebrovascular diseases (y_3)	≥0.85	X_1, X_2, X_3	X_1 X_3	-0.44 -0.29	≥0.85	X_1, X_2, X_3	X_2 X_3	-0.16 -0.06
Regression model	$y_1=126,3-0,13x1-1,5E-06x_3$				$y_1=184,24-0,36x_2-9,8E-07x_3$			
Diseases of diabetes (y_4)	Statistically insignificant relationship and effect				≥0.85	X_1, X_2	X_2	-0.45
Regression model					$y_1=5,36-0,03x_2$			
Diseases of circulatory system (y_5)	≥0.85	X_1, X_2, X_3	Statistically insignificant effect		≥0.85	X_1, X_2	X_2	-0.22
Regression model	x				$y_1=866,8-2,31x_2$			

Diseases of digestive system (y_6)	≥0.85	$X_1, X_2,$	Statistically insignificant effect		Statistically insignificant relationship and effect			
Diseases of the blood, blood forming organs and certain immunity disorders (y7)	≥0.85	X_1, X_2, X_3	Statistically insignificant effect		≥0.85	X_2	Statistically insignificant effect	
Endocrine, nutritional and metabolic diseases (y_8)	Statistically insignificant relationship and effect				≥0.85	X_1, X_2	X_2	-0.40
Regression model	x				$y_1=6,78-0,03x_2$			
External causes of injury and poisoning diseases (y_9)	≥0.85	X_2, X_3	X_2 X_3	-0.12 -0.17	≥0.85	$X_1, X_2,$	X_2	-0.68
Regression model	$y_1=71,67-0,26x_2-7,5E-07x_3$				$y_1=156,56-1,04x_2$			
Infectious and parasitic diseases (y_{10})	Statistically insignificant relationship and effect				≥0.85	X_1, X_2, X_3	Statistically insignificant effect	
Ischaemic (coronary) heart disease (y_{11})	≥0.85	X_1, X_2, X_3	Statistically insignificant effect		≥0.85	X_1, X_2	X_2	-0.17
Regression model	x				$y_1=570,58-1,23x_2$			

Diseases of malignant neoplasms (y_{12})	≥0.85	X_1, X_2, X_3	X_1	-0.47	≥0.85	X_1	X_1	-0.15
Regression model	$y_1=283,63-0,39x_1$				$y_1=165,82-0,01x_1$			
Diseases of mental disorders, diseases of nervous system and sense organs (y_{13})	Statistically insignificant relationship and effect				≥0.85	X_2	X_2	-0.77
Regression model	x				$y_1=7,61-0,05x_2$			

Source: own elaboration based on the data of WHO Regional Office for Europe, Statistics Poland (GUS) and State Statistics Service of Ukraine

Legend:

X_1 - Household Expenditures on Eating at Home

X_2 - Household Expenditures on Eating Out

X_3 - Performance Results of Catering Establishments

Appendix F

Results of correlation and regression analysis of the impact of consumption of food staples by households of Poland and Ukraine (x_i) upon the mortality of the population (y_i)

Mortality of the population (per 100 thousand people) (y_i)	Poland				Ukraine			
	Correlation relationship		Regression dependencies		Correlation relationship		Regression dependencies	
	Relationship strength	Factors (x_i)	Statistically significant factors (x_i)	Elasticity coefficient	Relationship strength	Factors (x_i)	Statistically significant factors (x_i)	Elasticity coefficient
Diseases of respiratory system (y_1)	Statistically insignificant relationship and effect				≥0.85	X_5, X_9, X_{10}	Statistically insignificant effect	
Cancer of the cervix uteri (y_2)	≥0.85	X_3,, X_5, X_6, X_7, X_9	Statistically insignificant effect		Statistically insignificant relationship and effect			
Cerebrovascular diseases (y_3)	≥0.85	X_3,, X_5, X_6, X_7, X_9	X_3 X_6 X_9	-1.51 +47.89 +95.10	≥0.85	X_5, X_9, X_{10}	Statistically insignificant effect	
Regression model	*y_1=-19,46-8,31x3+47,3x6+17,64x_9*				x			
Diseases of diabetes (y_4)	Statistically insignificant relationship and effect				≥0.85	X_5, X_9, X_{10}	Statistically insignificant effect	
Diseases of circulatory system (y_5)	≥0.85	X_3,, X_5, X_6, X_7, X_9	Statistically insignificant effect		≥0.85	X_5, X_9, X_{10}	Statistically insignificant effect	
Diseases of digestive system (y_6)	Statistically insignificant relationship and effect				Statistically insignificant relationship and effect			

Diseases of the blood, blood forming organs and certain immunity disorders (y7)	≥0.85	X_3, X_5, X_6, X_7, X_9	Statistically insignificant effect		≥0.85	X_5, X_9, X_{10}	X_{10}	+2.9
Regression model	x				*$y_1=0,83+0,24x_{10}$*			
Endocrine, nutritional and metabolic diseases (y_8)	Statistically insignificant relationship and effect				≥0.85	X_5, X_9, X_{10}	X_{10}	+1.41
Regression model	x				*$y_1=-1,97+0,92x_{10}$*			
External causes of injury and poisoning diseases (y_9)	≥0.85	X_1, X_2, X_3	Statistically insignificant effect		≥0.85	X_2, X_5, X_9, X_{10}	X_2	+1.77
Regression model					*$y_1=-278,56+8,99x_2$*			
Infectious and parasitic diseases (y_{10})	≥0.85	X_4	X_4	+1.36	≥0.85	X_4, X_5, X_9, X_{10}	X_4 X_{10}	+0.67 +1.70
Regression model	*$y_1=-1,98+18,08x4$*				*$y_1=17,54+11,74x_4+6,59x_{10}$*			
Ischaemic (coronary) heart disease (y_{11})	≥0.85	X_3, X_5, X_6, X_7, X_9	Statistically insignificant effect		≥0.85	X_5, X_9, X_{10}	Statistically insignificant effect	
Diseases of malignant neoplasms (y_{12})	≥0.85	$X_{3,}, X_5, X_6, X_7, X_9$	Statistically insignificant effect	Statistically insignificant effect		Statistically insignificant relationship and effect		

Diseases of mental disorders, diseases of nervous system and sense organs (y_{13})	Statistically insignificant relationship and effect	≥0.85	X_2, X_5, X_9, X_{10}	X_2	+2.94
Regression model	x	$y_1=-20,26+0,61x_2$			

Source: own elaboration based on the data of WHO Regional Office for Europe, Statistics Poland (GUS) and State Statistics Service of Ukraine

Legend:

X_1 - household consumption of meat and meat products

X_2 - household consumption of milk and dairy products

X_3 - household consumption of eggs

X_4 - household consumption of fish and fish products

X_5 - household consumption of sugar

X_6 - household consumption of vegetable oil and other vegetable fats

X_7 - household consumption of vegetables (for Poland, including potatoes) and melon crops

X_8 - household consumption of fruit, berries, nuts and grapes

X_9 - household consumption of bread and bakery products

X_{10} - household consumption of potatoes (for Poland it is not calculated separately)