

Assessment of the level of economic and social development of regions using the Hellwig taxonomic development measure

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Abstract: The paper presents the problem of regional development and its characterising determinants. The voivodeships constitute the highest level of Polish self-government administration. One of their responsibilities is to support regional development on their territory. Regional development includes quantitative and qualitative changes in the social and economic aspects of operation of voivodeships. Development is an ambiguous notion and it can be perceived through multiple social and economic determinants. It can be expressed both by research of macroeconomic variables, as well as the ongoing social and qualitative changes regarding the citizens' standard of living. The purpose of this article is the assessment of socio-economic development differentiation of Polish voivodeships between 2011 and 2016. The assessment was carried out using Hellwig taxonomic development measure. The level of development for each voivodeship was described with 23 variables. Among them the following can be mentioned: rate of natural increase per 1000 people, percentage of people in working age, total length of expressways and motorways per 1000 km², percentage of people using the water supply network, number of beds in general hospitals per 10 thousand people, number of people per one library facility, number of registered passenger cars per 1000 residents, net enrolment rate on secondary school level, number of children in kindergarten facilities per 1000 children between 3 and 5 years of age, degree of use of bed places, share of protected areas in the voivodeship area, percentage of voivodeship councillors with higher education, migration rate per 1000 residents, rate of registered unemployment, the average monthly gross salary, GDP per capita, voivodeship own revenue per capita, share of PIT tax revenue in the total own revenue of the voivodeship, share of CIT tax revenue in the total own revenue of the voivodeship, gross worth of fixed assets per capita, capital expenditure per capita, number of entities entered into the REGON registered per 10 thousand residents. A model of development was created, i.e. a hypothetical voivodeship with the best observed values of variables and the distance of every voivodeship to the model voivodeship was calculated. The research proposed a hypothesis assuming the existence of a differentiation in regional development in Poland. The average distances of voivodeships from the model for the years in question were found to be on a low, relatively stable level. At the same time the particular voivodeships also maintained their distance from the model and their rank on a comparable level. It was a proof of an existence of a relatively stable developmental differentiation for the voivodeships in question. The voivodeship characterised by the highest level of development in all the years in question was the Masovian voivodeship, while the voivodeships characterised with the lowest level of development were Lublin voivodeship and Warmian-Masurian voivodeship.

Keywords: regional development, regions, Hellwig development measure, Poland

JEL: O11, R11, R58

Introduction

Due to the position of voivodeships in the administrative structure of the country, their main purpose is endorsement of the broadly-understood civilisation regional development. The regional development on the voivodeship level comprises both quantitative and qualitative changes in the social and economic aspects of operation of these self-government units. The development can be perceived through numerous social and economic determinants and expressed both by research of macroeconomic variables as well as the social and qualitative changes related to the quality standard of living. The development is a continuous phenomenon. The pace of development, though, is varied in different parts of the country. It leads to an increasingly visible developmental polarisation on the regional level.

The purpose of the following article is to assess the differentiation of development for Polish voivodeships. The research conducted aimed at verifying the hypothesis assuming an existence of diversification of regional development in Poland. The research covers the years from 2011 to 2016. The proposed hypothesis was verified with Hellwig taxonomic development measure based on the data of the Local Data Bank of the Central Statistical Office.

Voivodeship as the regional level of local self-government

“Local self-government is a union of the local community distinguished within the structure of the state, created based on the provisions of law, created for autonomous realisation of public administration, provided with material measures allowing for realisation of the entrusted responsibilities [Ochendowski; 1997; p. 22]”. Self-government is a decentralised form of public administration, i.e. public administration realised by entities other than the state power, based on relative autonomy [Jaskiernia; 2011; p. 22-23]. The distinguished self-government division units are supposed to be “little homelands” for their residents.

As a result of the law on introduction of a general three-tier territorial division of the state on January 1st 1999 a three-level self-government administration structure was implemented. The units of three-tier territorial division of the state are as follows: municipalities, counties and voivodeships. The regional level of Polish public administration comprises of voivodeships. According to the implemented self-government reform, 16 voivodeships were created: Lower Silesian, Kuyavian-Pomeranian, Lublin, Lubusz, Łódź, Lesser Poland, Masovian, Opole, Subcarpathian, Podlaskie, Pomeranian, Silesian, Świętokrzyskie, Warmia-Masurian, Greater Poland, West Pomeranian. Since the voivodeships are just the regional level, their actions are aimed directly at particular citizens only in limited scope. Their basic purpose is to act for the broadly-understood civilisation development. The voivodeships must be characterised by a scale sufficient to concentrate resources in specific

guidelines. Creation of metropolitan urban centres, which guarantee a proper economic, institutional and intellectual potential, is a decisive factor for the possibility of existence of regional self-government units. The 49 voivodeships, which existed up till 1999 and comprised too small areas to have the proper academic background, were not suitable for such model of voivodeship [Gorzela, Jałowiecki, Stec; 2001; p. 52].

According to the act on voivodeship government, the citizens build a regional self-governing community by the force of law [The act on voivodeship government; 1998; art. 1]. The scope of responsibilities of the voivodeship self-government comprises realisation of public duties characteristic for voivodeship, not reserved by law for state administration organs [The act on voivodeship government; 1998; art. 2]. The scope of activity of the voivodeship self-government must not infringe the autonomy of counties and municipalities [The act on voivodeship government; 1998; art. 4].

The voivodeship self-government defines the development strategy for the voivodeship, taking into consideration particularly the following goals [The act on voivodeship government; 1998; art. 11]:

- care for Polish values and shaping the national, civil and cultural identity of the citizens, as well as care and development of local identity;
- stimulating economic activity;
- raising the level of competitiveness and innovations of the voivodeship economy;
- protection of the cultural and natural environment by taking into consideration the needs of future generations;
- shaping and maintaining spatial order.

One of the duties of the voivodeship self-government is realisation of voivodeship policy, which comprises [The act on voivodeship government, 1998, art. 11]:

- creating conditions for economic development, including stimulation of the labour market;
- maintaining and developing the social and technical infrastructure on the voivodeship level;
- acquiring and joining public and private funds for the purposes of realisation of tasks in the field of public utility;
- supporting and leading the activities for raising the level of education among the citizens;
- rational use of natural resources and shaping the natural environment according to the sustainable development rule;

- supporting the science and cooperation between science and economy, endorsing technological advancements and innovations;
- stimulating the cultural growth and caring for the cultural heritage and its rational utility;
- promotion of advantages and developmental opportunities of the voivodeship;
- supporting and leading actions for social interaction and taking counter-measures against social exclusion.

Regional development and its determinants

The discussion on the development issue can be started by specifying the difference between local development and regional development. After the introduction of three-stage administrative division of the state, the local development is considered the development process, taking place on the area of municipalities, cities and counties. The development on the level of every self-government voivodeship is considered regional development [Szewczuk, Kogut-Jaworska, Ziolo; 2011; p. 14]. „Development” is a basic notion. In science, practice, politics and common life it is generally defined and ambiguous. The notion is not only an undefined, ambiguous notion, but also a primal one [Piontek, Piontek; 2016; p. 14]. The notion of regional development is usually associated with desirable, positive quantitative, qualitative and structural transformations of the given area. It is a process of guided transformations, through which a transformation from simpler to more complex and perfect forms or states occurs [Nowa encyklopedia powszechna; 1997; p. 616]. Development creates an opportunity for progress in multiple fields of life: economic, social, cultural and political, allows for creating new values.

Regional development is a multi-dimensional notion, the complexity of which is a direct result of a multitude of its shaping factors. The level of development can be perceived through a wide range of characteristics of a voivodeship, e.g. economic situation of the voivodeship as a territorial self-government unit, economic situation and quality of life of its residents and level of infrastructure development in the voivodeship. All these characteristics can be divided into two groups of determinants – economy-related determinants and society-related determinants.

The level of regional development using the Hellwig measure

As it was pointed out in the introduction, the purpose of the paper is to assess the development differentiation of Polish voivodeships. This assessment was conducted with taxonomic development measure calculated with Hellwig method. The research was conducted in the following stages [Pomianek, Chrzanowska, Bórawski; 2013; p. 444]:

1. Choice of a set of variables and defining them;
2. Creation of a taxonomic development measure with Hellwig method;
3. Setting a ranking of voivodeships and dividing them into classes.

The concept of a taxonomic development measure was proposed by Z. Hellwig in 1968. Its use allows for arranging separated objects, e.g. territorial units, and dividing them into groups. The taxonomic values of the development measure are a resultant of the level of variables regarding various aspects of the researched phenomenon [Pietrzak; 2014; p. 182]. The purpose of calculating a taxonomic development measure is to arrange the objects according to the level of multi-characteristic phenomena. The Hellwig development measure allows for conducting a synthesis of information from a sequence of variables and attributing one aggregate measure to the analysed phenomenon [Krakowiak-Bal; 2005; p. 72].

Using the Hellwig taxonomic development measure allowed for arranging the set of voivodeships P_i (where: $i = 1, 2, \dots, n$; $n=16$), where each of them was described with a set of 23 diagnostic characteristics, which include stimulants and destimulants.

The first stage of the research was the choice of variables to construct the measure. The variables must be measurable, available and complete. As it was mentioned in the introduction, the necessary data were collected from Local Data Bank of the Central Statistical Office. While choosing the variables, the authors made effort for the variables to broadly describe the socio-economic development of Polish voivodeships. The economic development of the voivodeships, as well as the quality of life perceived by its citizens, were important. The variables chosen for the research to construct the Hellwig taxonomic measure had to be measurable, available and complete. These requirements made it impossible to analyse the variables, the data for which was not gathered at the Local Data Bank of the Central Statistical Office for the voivodeship level and could not be obtained in any other way. Initially, 23 variables characterising the socio-economic development of voivodeships were chosen for the set of variables:

1. Rate of natural increase per 1000 people (in persons) – stimulant;
2. Percentage of people in working age (in %) – stimulant;
3. Total length of expressways and motorways per 1000 km² (in km) – stimulant;
4. Percentage of people using the water supply network (% of total population) – stimulant;
5. Percentage of people using the sewer system (% of total population) – stimulant;
6. Number of beds in general hospitals per 10 thousand people – stimulant;
7. Number of people per one library facility – stimulant;
8. Number of registered passenger cars per 1000 residents - stimulant;

9. Net enrolment rate on the secondary school level (in %) – stimulant;
10. Number of children in kindergarten facilities per 1000 children between 3 and 5 years of age (in persons) – stimulant;
11. Degree of use of bed places (in %) – stimulant;
12. Participation of protected areas in the voivodeship area (in %) – stimulant;
13. Percentage of voivodeship councillors with higher education (in %) – stimulant;
14. Migration rate per 1000 residents (in persons) – stimulant;
15. Rate of registered unemployment (in %) – destimulant;
16. The average monthly gross salary (economic entities with less than 9 working persons were excluded (in PLN) – stimulant;
17. GDP per capita (in PLN) – stimulant;
18. Voivodeship own revenue per capita (in PLN) – stimulant;
19. Participation of PIT tax revenue in the total own revenue of the voivodeship (in %) – stimulant;
20. Participation of CIT tax revenue in the total own revenue of the voivodeship (w %) – stimulant;
21. Gross worth of fixed assets per capita (in thousands of PLN) – stimulant;
22. Capital expenditure per capita (in PLN) – stimulant;
23. Number of entities entered into the REGON registered per 10 thousand residents – stimulant.

After choosing the potential variables, the quasi-constants were eliminated. It was done by using the characteristics variability rate. For every j th variable the variability rate was calculated.

$$(1) \quad V_j = \frac{S_j}{x_j} \quad , (j = 1, 2, \dots, m; m=23)$$

where:

V_j – variability rate for the j th variable;

S_j – standard deviation for the j th variable, calculated from the formula:

$$(2) \quad S_j = \sqrt{n^{-1} \sum_{i=1}^n (x_{ij} - \bar{x}_j)^2} \quad , (i = 1, 2, \dots, n; j = 1, 2, \dots, m)$$

where:

x_{ij} – the value of j th variable for the i th object;

n – number of tested objects

\bar{x}_j – arithmetic mean of the j th variable, calculated from the formula:

$$(3) \quad \bar{x}_j = n^{-1} \sum_{i=1}^n x_{ij} \quad , (i = 1, 2, \dots, n; j = 1, 2, \dots, m)$$

The variables, for which the variability rate (V_j) was lower than the chosen critical value, were eliminated from the set. The critical value for the variability rate was chosen to be on the level of 0.05. Due to a low variability of a group of variables, three variables were dismissed: percentage of people in working age, net enrolment rate on the secondary school level, percentage of voivodeship councillors with higher education. As a result, a set of 20 variables was obtained – they are presented in Table 1.

Table 1. Variables chosen for the research

Symbol	Variable
X ₁	Rate of natural increase per 1000 people (in persons)
X ₂	Total length of expressways and motorways per 1000 km ² (in km)
X ₃	Percentage of people using the water supply network
X ₄	Percentage of people using the sewer system (% of total population)
X ₅	Number of beds in general hospitals per 10 thousand people
X ₆	Number of people per one library facility
X ₇	Number of registered passenger cars per 1000 residents
X ₈	Number of children in kindergarten facilities per 1000 children between 3 and 5 years of age (in persons)
X ₉	Degree of use of bed places (in %)
X ₁₀	Participation of protected areas in the voivodeship area (in %)
X ₁₁	Migration rate per 1000 residents (in persons)
X ₁₂	Rate of registered unemployment (in %)
X ₁₃	The average monthly gross salary (economic entities with less than 9 working persons were excluded (in PLN)
X ₁₄	GDP per capita (in PLN)
X ₁₅	Voivodeship own revenue per capita (in PLN)

Symbol	Variable
X ₁₆	Participation of PIT tax revenue in the total own revenue of the voivodeship (in %)
X ₁₇	Participation of CIT tax revenue in the total own revenue of the voivodeship (w %)
X ₁₈	Gross worth of fixed assets per capita (in thousands of PLN)
X ₁₉	Capital expenditure per capita (in PLN)
X ₂₀	Number of entities entered into the REGON registered per 10 thousand residents

Source: own elaboration.

The set of variables describing the voivodeships in question was arranged in an observation matrix X:

$$(4) \quad X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1p} \\ x_{21} & x_{22} & \dots & x_{2p} \\ \dots & \dots & \dots & \dots \\ x_{n1} & x_{n2} & \dots & x_{np} \end{bmatrix} \quad , (i = 1, 2, \dots, n; j = 1, 2, \dots, p; p=20)$$

where:

x_{ij} – values of the j th characteristic for an i th object.

The diagnostic variables accepted for the research were characterised by varying, and thus incomparable, measures – they were expressed i.a. in persons, kilometres, percentages or PLN. To standardise them, they were normalised by standardisation according to the formula:

$$(5) \quad z_{ij} = \frac{x_{ij} - \bar{x}_j}{S_j} \quad , (i = 1, 2, \dots, n; j = 1, 2, \dots, p)$$

where:

z_{ij} – standardised value of x_{ij} ;

\bar{x}_j – arithmetic mean of the j th variable;

S_j – standard deviation of the j th variable.

As a result of the standardisation, a Z matrix of standardised characteristic values was obtained.

$$(6) \quad Z = \begin{bmatrix} z_{11} & z_{12} & \dots & z_{1p} \\ z_{21} & z_{22} & \dots & z_{2p} \\ \dots & \dots & \dots & \dots \\ z_{n1} & z_{n2} & \dots & z_{np} \end{bmatrix} \quad ,(i = 1, 2, \dots, n; j = 1, 2, \dots, p)$$

where:

z_{ij} – standardised value of x_{ij} .

Based on the matrix Z , a model of development, i.e. an abstract voivodeship P_0 with standardised coordinates $z_{01}, z_{02}, \dots, z_{0j}$, where $z_{0j} = \max\{z_{ij}\}$, when Z_j is a stimulant and $z_{0j} = \min\{z_{ij}\}$, when Z_j is a destimulant, was created. From all the variables chosen for the research, only the registered unemployment rate was considered a destimulant. The model can be perceived as a vector, the coordinates of which are the best values of subsequent standardised diagnostic characteristics. The model is an artificially, idealistically construed object, characterised by optimal properties expressed in correspondingly specified functions of the values of particular diagnostic characteristics. The model was a hypothetical voivodeship with the best observed values of the variables. The situation of real units in question was subsequently compared to the construed model. As a result it was found that all the voivodeships are distant from the model [Młodak; 2006; p. 121].

Subsequently, the distance to the model (d_i) for all the voivodeships was calculated from the formula:

$$(7) \quad d_i = 1 - \frac{D_{i0}}{D_0} \quad ,(i = 1, 2, \dots, n)$$

where:

d_i – taxonomic development measure for the i th object;

D_{i0} – the distance of the i th object to the object P_0 , calculated from the formula:

$$(8) \quad D_{i0} = \sqrt{\sum_{j=1}^p (z_{ij} - z_{0j})^2} \quad ,(i = 1, 2, \dots, n; j = 1, 2, \dots, p)$$

where:

z_{ij} – normalised value of the j th variable for the i th object;

z_{0j} – the model standardised value of the j th variable;

D_0 – guaranteeing the value of d_i to belong to a range between 0 and 1, calculated from the formula:

$$(9) \quad D_0 = \overline{D_0} + 2S_0$$

where:

$\overline{D_0}$ – mean value of the norm;

S_0 – standard deviation from the norm.

The average mean value and the standard deviation were calculated from the formulas below:

$$(10) \quad \overline{D_0} = n^{-1} \sum_{i=1}^n D_{i0}$$

$$(11) \quad S_0 = \sqrt{n^{-1} \sum_{i=1}^n (D_{i0} - \overline{D_0})^2}$$

Thus the synthetic determinants for every voivodeship were specified. The value Hellwig taxonomic development d_i was comprised within the range [0,1] – the closer the values of particular characteristics were to the model, the higher was the development level, and the more distant were the values the lower was the development level.

The next stage was the division of voivodeships into classes based on their level of socio-economic development. The classification was performed with the arithmetic mean distance from the model ($\overline{d_i}$). All the voivodeships were divided into two groups:

- group I – underdeveloped voivodeships for which the value of d_i measure was lower than the arithmetic mean distance from the model;
- group II – well-developed voivodeships, for which the value of d_i measure was greater than the arithmetic mean distance from the model.

Average distance of voivodeships from the construed model for the years 2011-2016 is presented in Table 2.

Table 2. Mean arithmetic distance of regions from the model of development

for the years 2011-2016 ($\overline{d_i}$)

Year	2011	2012	2013	2014	2015	2016
Mean arithmetic distance to the model	0.271	0.262	0.278	0.272	0.283	0.280

Source: own elaboration.

The mean levels of distance from the model were maintained relatively low and, at the same time, relatively stable, fluctuating between 0.267 to 0.283. It is a proof of a very significant distance of the voivodeships in question from the construed development model and maintained stagnation in development level differentiation on the regional level in Poland.

Table 3. Regions with the best values of the tested characteristics in the years 2011-2016

Char.	2011	2012	2013	2014	2015	2016
1	Pomeranian	Pomeranian	Pomeranian	Pomeranian	Pomeranian	Pomeranian
2	Silesian	Silesian	Silesian	Silesian	Silesian	Silesian
3	Opole	Opole	Opole	Opole	Opole	Opole
4	Pomeranian	Pomeranian	Pomeranian	Pomeranian	Pomeranian	Pomeranian
5	Silesian	Silesian	Silesian	Silesian	Silesian	Silesian
6	Pomeranian	Pomeranian	Pomeranian	Pomeranian	Pomeranian	Pomeranian
7	Greater Poland	Greater Poland	Greater Poland	Greater Poland	Greater Poland	Greater Poland
8	Opole	Opole	Opole	Opole	Opole	Masovian
9	Western-Pomeranian	Western-Pomeranian	Western-Pomeranian	Western-Pomeranian	Western-Pomeranian	Western-Pomeranian
10	Świętokrzyskie	Świętokrzyskie	Świętokrzyskie	Świętokrzyskie	Świętokrzyskie	Świętokrzyskie
11	Masovian	Masovian	Masovian	Masovian	Masovian	Masovian
12	Greater Poland	Greater Poland	Greater Poland	Greater Poland	Greater Poland	Greater Poland
13	Masovian	Masovian	Masovian	Masovian	Masovian	Masovian
14	Masovian	Masovian	Masovian	Masovian	Masovian	Masovian
15	Masovian	Masovian	Masovian	Masovian	Masovian	Masovian
16	Podlaskie	Podlaskie	Świętokrzyskie	Podlaskie	Podlaskie	Warmian-Masurian
17	Masovian	Masovian	Masovian	Masovian	Masovian	Masovian
18	Masovian	Masovian	Masovian	Masovian	Masovian	Masovian
19	Masovian	Masovian	Masovian	Masovian	Masovian	Masovian
20	Masovian	Masovian	Masovian	Masovian	Masovian	Masovian

Source: own elaboration.

Table 3 present the voivodeships characterised by the highest values of particular characteristics in the years 2011-2016. As it is clear from the above, neither of the voivodeships dominated in all categories. Within the specified characteristics in the next years, the leaders

generally remained unchanged. Only in the eighth characteristic (children in kindergarten facilities per 1 thousand children between 3 and 5 years of age) and characteristic 16 (participation of PIT tax revenue in total own revenue of the voivodeship) the leaders were changed in subsequent years. It must be noticed that the voivodeship, which took lead with regards to most of the characteristics, was the Masovian voivodeship. Table 4. Hellwig taxonomic development measures for the years 2011-2016 (the underdeveloped regions are marked in red, the well-developed regions in black).

Table 1. Hellwig taxonomic development measures for the years 2011-2016 (the underdeveloped voivodeships are marked in red, the well-developed voivodeships in black)

Voivodship	2011	Voivodship	2012	Voivodship	2013	Voivodship	2014	Voivodship	2015	Voivodship	2016
Lublin	0,091	Lublin	0,084	Warmian-Masurian	0,075	Warmian-Masurian	0,080	Lublin	0,086	Lublin	0,075
Warmian-Masurian	0,103	Warmian-Masurian	0,100	Lublin	0,099	Lublin	0,103	Warmian-Masurian	0,106	Warmian-Masurian	0,118
Subcarpathian	0,114	Subcarpathian	0,116	Świętokrzyskie	0,141	Świętokrzyskie	0,128	Subcarpathian	0,121	Świętokrzyskie	0,125
Podlaskie	0,147	Podlaskie	0,135	Subcarpathian	0,147	Subcarpathian	0,130	Świętokrzyskie	0,138	Subcarpathian	0,128
Świętokrzyskie	0,170	Świętokrzyskie	0,153	Podlaskie	0,157	Podlaskie	0,161	Podlaskie	0,146	Podlaskie	0,145
Opole	0,232	Kuyavian-Pomeranian	0,210	Kuyavian-Pomeranian	0,236	Kuyavian-Pomeranian	0,234	Kuyavian-Pomeranian	0,258	Kuyavian-Pomeranian	0,225
Kuyavian-Pomeranian	0,233	Opole	0,236	Opole	0,258	Lubusz	0,256	Opole	0,272	Western-Pomeranian	0,271
Lubusz	0,256	Lubusz	0,257	Lubusz	0,272	Opole	0,259	Lubusz	0,275	Opole	0,277
Western-Pomeranian	0,266	Western-Pomeranian	0,264	Western-Pomeranian	0,274	Western-Pomeranian	0,261	Western-Pomeranian	0,281	Lubusz	0,288
Łódź	0,272	Łódź	0,286	Łódź	0,299	Lesser Poland	0,297	Łódź	0,309	Łódź	0,295
Lesser Poland	0,281	Lesser Poland	0,294	Lesser Poland	0,311	Łódź	0,298	Lesser Poland	0,320	Lesser Poland	0,333
Pomeranian	0,369	Pomeranian	0,337	Greater Poland	0,358	Greater Poland	0,375	Silesian	0,397	Pomeranian	0,385
Greater Poland	0,373	Greater Poland	0,371	Pomeranian	0,390	Pomeranian	0,376	Pomeranian	0,398	Greater Poland	0,388
Lower-Silesian	0,403	Lower-Silesian	0,372	Lower-Silesian	0,405	Lower-Silesian	0,397	Greater Poland	0,406	Silesian	0,411
Silesian	0,447	Silesian	0,418	Silesian	0,426	Silesian	0,419	Lower-Silesian	0,418	Lower-Silesian	0,440
Masovian	0,574	Masovian	0,566	Masovian	0,603	Masovian	0,585	Masovian	0,603	Masovian	0,579

Source: own elaboration.

Table 4 presents the distances of particular voivodeships from the model. The Masovian voivodeship was the closest to the model for all the years. The Silesian, Lower-Silesian and Greater Poland voivodeships took places in the top 3 in subsequent years. The voivodeships farthest from the ideal were the Lublin and Warmian-Masurian voivodeship. It should be noted that the degree of distance of particular voivodeships and their average distance from the development model in subsequent years were maintained on an almost identical level. Thus it must be stated that the level of development disproportion on the voivodeship level did not change in subsequent years. Very large differences of the development degree on the voivodeship level between the voivodeships from the top and from the bottom of the list pose a particular concern. The distance of the best-developed voivodeship was over eight times closer to the model than the least-developed voivodeship. Also, a very significant division into well-developed Poland “A” and underdeveloped Poland “B”, where the border between them runs along the Vistula river. Most of the well-developed voivodeships were situated West of Vistula, and most of the underdeveloped were East of this River. As a result of an analysis of the data gathered in the Table 4 it can be stated that the hypothesis assuming an existence of differentiation of the level of development on the voivodeship level was confirmed.

Summary

Regional development is connected with desirable, positive quantitative, qualitative and structural transformations of the area of a given region. Based on the research conducted, the hypothesis assuming the existence of a differentiation in the level of development for the regions can be considered as confirmed. To verify the hypothesis, the Hellwig taxonomic development measure was used. The level of development for all the regions was described through 20 variables, based on which a synthetic development measure was calculated for all of them. A development model, i.e. a hypothetical region with the best values of the variables, was created. The distance of every region to the model region was measured. The average distances of regions from the model for the years 2011-2016 were found to be on a low, relatively stable level. At the same time the particular regions also maintained their distance from the model and their rank on a comparable level. This was proof of the existence of a relatively stable developmental differentiation for the regions in question during the analysed years. The best-developed region over all the years in question was the Mazowieckie region, while the regions characterised by the lowest level of development were the Lubelskie and Warmińsko-Mazurskie regions.

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