Marijana Joksimovic
Academy of Criminalistic and Police Studies, Serbia
ORCID: 0000-0002-5939-5137, email: joksimovicm@naisbitt.edu.rs

Dusan Joksimovic
Academy of Criminalistic and Police Studies, Serbia
ORCID: 0000-0001-7972-1991, email: dusan.joksimovic@kpa.edu.rs

Nassir Ishneen
Megatrend University, Serbia
ORCID: 0000-0001-6948-227X, e-mail: naser772007@yahoo.com

The impact of oil price shocks on Libyan economic growth

Abstract: The aim of this paper is to describe the impact of oil price shocks on the main components of the balance of payments. It is important to examine the trends in oil prices during the period under consideration. The authors analyze the impact of such shocks on Libyan economic growth. Based on available data for the years 1970-2008, the paper presents an overview of the Libyan economy with a particular focus on the role of oil.

Keywords: shocks, oil prices, balance of payments, economic growth, exports

JEL: E44, F21

Introduction

The main aim of this paper to show the impact of shocks in oil prices on the main components of the balance of payments, it is important to examine the trends in oil prices during the period. More specifically, to assess the effect of the changes in exporting oil prices on Libyan economic growth, to explore it's effects on the relationship of economy in Libya and economy of its mayor partners in trade, to examine what kind of impact can these changes in prices of oil have on the balance of resources in Libya.

The date collected for the analysis include years from 1970 to 2008, during which time a number of important economic development plans were started in Libya. In order to achieve the study aims, the correlation between the increase of Libyan oil export and the county's GDP is tested and co-integration analysis is used to study the long-term correlation of Libyan GDP and exports of oil. The paper also uses the simultaneous-equations models to study the
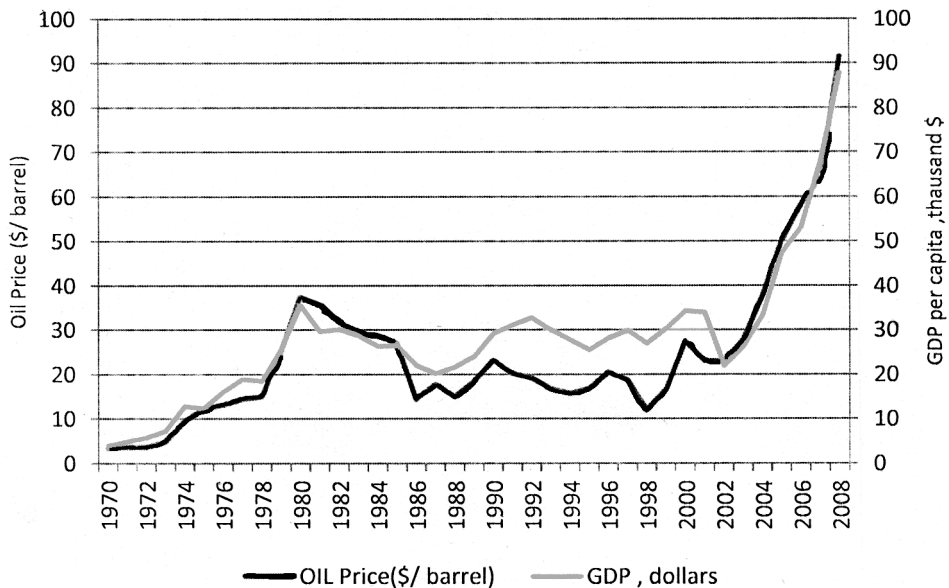
trade relations of Libya and its main trade partners. Furthermore, single and simultaneous-equations models are developed and tested to study the effects of oil price fluctuations on balance of payments of Libyan economy.

Significance of Oil Exports in the Libyan Economy

This section provides an overview of the Libyan economy with a particular focus on the role of oil. Figure 1 provides a first impression regarding the relation between GDP as well as the oil price. It is evident that both variables follow a very similar pattern. Therefore, The GDP.

Figure confirms impression that high levels of GDP are accompanied by high levels of the price of oil. During the period of high oil price (1973-1981) and (1999-2008) there is increase in Libyan GDP, while during the periods of low oil price (1982-1989) and (1990-1998) there is decrease in Libyan GDP.

Figure 1. Relation between Oil price and Libyan GDP (1970-2008)

Source: The Central Bank of Libya, the economic bulletin, various issues. Secretariat of the General People's Committee for Planning.

Furthermore, Table 1 demonstrates Gross Domestic Product (GDP) of the Libyan economy by oil and non-oil GDP during the period from 1970 to 2008. It can be seen from the table that the Oil revenue dominates the Libyan economy, accounting for high proportion of national income. Also, Oil production makes a greater contribution to GDP than other economic activities. However, the

percentage of the oil contribution to GDP differed in various periods due to fluctuations in oil prices.

Table 1. Libyan Gross Domestic Product in selected years (1970-2008)

Year	GDP	Oil GDP	Non-Oil GDP
Value in billion $		%	%
1970	4.0	62.5	37.5
1975	12.4	59.6	40.4
1980	35.6	68.7	31.3
1985	26.5	55.0	45
1990	29.1	40.5	59.5
1995	25.5	43.9	56.1
2000	34.4	48.5	51.5
2004	33.3	74.4	25.6
2008	87.8	81.3	18.7

Source: The Central Bank of Libya, the economic bulletin, various issues. Secretariat of the General People's Committee for Planning.

The oil sector contributed almost 62.5% of gross domestic product in 1970, which had decreased to about 40.5% by 1990. The total contribution of the non-oil sector was about 37.5% in 1970, increasing to 56.1% in 1995. The gross domestic product at current prices was 4 billion dollar in 1970, and this increased about 5 fold and 21 fold to 29.1 billion and 87.8 in 1990 and 2008 respectively. Because of Libya's great dependence on oil revenues, the general level of the Libyan economy is closely related to the health of the petrochemicals industry.

Rates of Growth of Libyan Oil Exports and Non-oil Sectors

Since the main aim of this paper is to find the impact of shocks in oil prices on the main components of the balance of payments, it is important to examine the trends in oil prices during the period 1960-97. It is possible to distinguish four sub periods over which oil prices fluctuated heavily. These sub-periods are: 1974-1981; 1982-1989; 1990-1998; 1999-2008.

The first and forth periods represent the years of relative stagnation in oil prices while the second and third periods represent substantial increases in oil prices.

Table 2 represents estimates of the (constant proportional) rates of growth over the four periods that experienced fluctuations in oil prices since 1974. The growth rates were calculated using the regression model:

$$Log_e Y_{it} = \beta_0 + \beta_1 T + \eta_t \qquad\qquad 1$$

Where Y_{it} represents the output of the ith sector in period t and t represents time. The coefficient β_1 represents the proportional (constant) rate of growth i.e.

$$\beta_1 = \left(\frac{dy}{dt} \right) / y \qquad\qquad 2$$

The data in Table 2 shows that the rates of growth of output of Libyan oil exports and output of non-oil sectors (assessed in current values and measured in US dollars.) were greater (in most cases during the period 1974-1981 and 1999-2008 when oil prices were high comparing with periods 1982-1990 and 1991-1998 when oil prices were low. The data in the Table also suggest that because the Libyan Dinar was highly devalued against the US dollar since 1999, the values of sectoral output, measured in US dollars, had declined significantly over the period 1999-2008.

Table 1. Rate of Growth of Libyan sectorial output (percentage)

sectors	1974-1981	1982-1990	1991-1998	1999-2008	1974-2008
Oil Exports	16.1	-6.3	-5.2	22.2	2.6
Total Non-Oil	15.3	5.9	-1.7	-0.4	3.0
Agriculture	16.1	13.9	-0.4	-6.7	4.7
Manufacturing	20.6	11.8	-2.6	6.8	6.0
Construction	13.7	-6.6	-1.1	4.6	0.7
Wholesale & Retail trade	16.7	5.6	-1.0	1.2	3.3
Transport & Communication	14.5	5.9	-1.1	1.7	3.2
Other activities	15.3	7.0	-2.2	-3.3	2.8

Source: author calculations.

As a result, the growth rates of all sectors were negative during that period, despite the fact that oil exports (measured in US dollars) during the same period, enjoyed a very high rate of growth. When measured in local prices, all Libyan non-oil sectors, with the exception of agriculture and trade, had a zero rate of growth. This suggests that the Libyan economy did not benefit from the growth in its oil exports during the last few years.

Relationship between Exports and Economic Growth

The mechanism by which exports could act as an `engine of growth' (or leading sector) and the determinants of the overall impact of an export stimu-

lation on the economy have been well discussed in the literature [Metwally 2004; Ram 1987]; [Severn 1968]; [Srinivasan 2001], [Syron and A. 1968], [Tamachke and London 1979] and [Watkins 1977]. Exports contribute to economic growth directly (through direct contributions to GDP) and indirectly through contributions to GDP per medium of spread (or carry-over) effects. The indirect contribution to growth holds Hirschman-type linkages and can broadly be considered as a sequence of multiplier-accelerator mechanisms. It is also claimed that the instability of commodity prices has an important impact on economic growth [Cashin et al. 2002; Ghosh and Ostry 1994; Massell 1990; Maitah et al. 2013]. The postulated relationship between export growth and GDP over time is central to the `exports as an engine of growth' model; theoretically exports can contribute to the growth of GDP directly and indirectly per medium of spread effects, which taken time.

It is important to note even at this early stage, that apart from the notion that the growth of the export sector and GDP are related over time (per medium of a sequence of multiplier-accelerator mechanisms), the model says little or nothing about what length of time might actually be involved, This shortcoming is obviously not confined to the `exports as an engine of growth' model alone and seems to be common to all economic theory postulating lagged time relationships between variables, The question of determining time lags between export growth and economic growth must therefore be central to econometric investigations of trade and growth. As Metwally and Tamaschke (1980b) argued, this aspect has in fact been sadly neglected in the existing econometric literature in the area. With this in mind the central tool used in the analysis to follow, is the dynamic (or lagged) regression relationship utilizing annual data, which is the form taken by most of the important available series. When preliminary investigations suggested that the current period provided the most important weight, geometrically declining weights were imposed from the current period (that is a Koyck distributed lag scheme, Koyck, 1954). For statistical reasons, discrete lags were used in other cases. The equations were calculated from variables in natural logarithmic first difference form (that is: log-logi), which is virtually a percentage change. There are a number of theoretical reasons for this. First, because spread effects include acceleration effects, proper specification suggests that the equations incorporate some concept of change. Second, since we do not necessarily expect a constant impact on the economy over time of an export stimulus of given intensity (for instance because of diversification of the economy, import substitution and technological change) simple linear relationships would seem to be inappropriate [Metwally and Tamaschke 1980b].

Hence, natural log differences have been used in an attempt to deal with these problems. The equations were tested for multicollinearity along the lines suggested by [Farrar and Glauber 1967] and give no undue cause for concern. Inspection of the residuals in the series (that are too short to test

the assumption of homoscedasticity amongst the residuals about the fitted equations), suggested that there is no cause for concern in this respect. Autocorrelation tests, using Durbin "h" statistics, suggested by Durbin (1970) were not used in small periods.

Table 3 provides the econometric results of the investigations into the relationship between export growth and GDP (in current prices) for the four periods that exhibit variations in oil prices. The following regression model was used:

$$In(Y_t/Y_{t-1}) = \beta_0 + \beta_1 In(X_t/X_{t-1}) + \beta_2 In(Y_{t-1}/Y_{t-2}) + \eta_t \qquad 3$$

Where: Y = GDP
X = Oil exports.

The regression results suggest that the current period export coefficient is highly significant in all periods. By way of contrast, however, the lagged GDP variable (representing all lagged exports via the Koyck geometrically declining weight assumption Koyck, 1954) is significant at least at the 5% level only in the periods that enjoyed high oil prices (1974-1981 and 1999-2008). As this part of the results could be explained as representing the spread effects, the results clearly imply that the Libyan GDP has benefited from opportunities generated by increase in oil exports. However, the lagged effects are outweighed by the current period contributions, which could suggest that the investment opportunities generated, are not fully exploited.

Two important points can be raised against the econometric results in Table 3: (1) These results were computed from data valued at current prices and thus may show strong inflationary impacts; (2) The result of the coefficients of the variable In (Xt/Xt_1), may be an expression of the simple fact that exports are an element of GDP. To exclude the inflationary effects the relationship between oil export and GDP was re-estimated in constant prices. As Metwally and Tamaschke (1980) argued, that deflating exports by an index of import prices and not by an index of export prices should be more acceptable.

Table 2. Libyan oil exports and gross domestic product (current price)

The Model: $In(Y_t/Y_{t-1}) = \beta_0 + \beta_1 In(X_t/X_{t-1}) + \beta_2 In(Y_{t-1}/Y_{t-2}) + \eta_t$						
Periods	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_2$	**F**	**R²**	**DW**
1974-1981	.023	.690**	.156*	0.99	249.04	3.69
t	1.09	20.30	2.41			
1982-1990	.009	.315*	.075	0.61	4.79	1.89
t	.29	2.68	.24			
1991-1998	.025	.422*	.621*	0.68	5.21	1.63
t	.99	2.99	2.53			

The Model: $In(Y_t/Y_{t-1}) = \beta_0 + \beta_1 In(X_t/X_{t-1}) + \beta_2 In(Y_{t-1}/Y_{t-2}) + \eta_t$						
Periods	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_2$	**F**	**R²**	**DW**
1999-2008	-.091	.826*	.302	0.62	5.71	2.83
t	-1.15	3.27	1.31			
1974-2008	.021	.529**	.195*	.696	36.700	2.463
t	1.073	8.308	1.993			
Note: * denotes 1 percent level of significance and ** denotes 5 percent level of significance						

Source: author calculations.

Therefore, both GDP and oil exports were deflated by an index of import prices. Given that, an increase in the price of exports relative to that of imports (i.e. an improvement in the terms of trade) reflects a true gain to the economy. The following model was tested:

$$In(Y_t/Y_{t-1}) = \beta_0 + \beta_1 In(X_t/X_{t-1}) + \beta_2 In(Y_{t-1}/Y_{t-2}) + \eta_t \qquad 0$$

Where: Y- = GDP valued at constant import prices (1973=100)
X- = Oil exports valued at constant import prices (1973=100)

The econometric results obtained using this method of deflation is shown in Table 4. These results conform partially with those in Table 3 (where variables are valued at current prices). The regression results indicate that the export coefficient is highly significant in all periods.

Table 3. Oil exports and gross domestic product (deflated by import price)

The Model: $In(Y_t/Y_{t-1}) = \beta_0 + \beta_1 In(X_t/X_{t-1}) + \beta_2 In(Y_{t-1}/Y_{t-2}) + \eta_t$						
Periods	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_2$	**F**	**R Square**	**Durbin- -Watson**
1974-1981	.011	.743**	.078	.983	144.98	2.90
t	.498	13.68	.819			
1982-1990	.065	.340	-.194	.535	3.453	2.36
t	1.607	2.10	-.994			
1991-1998	.069	.520	-.006	.368	1.454	2.23
t	1.13	1.67	-.017			
1999-2008	-.098	.933**	.154	.850	19.788	2.08
t	-1.69	5.62	.997			
1974-2008	.012	.703**	.122	.723	41.744	2.15
t	.459	9.13	1.31			
Note: * denotes 1 percent level of significance and ** denotes 5 percent level of significance						

Source: author calculations.

In contrast, the lagged GDP variable was not significant at any period. Therefore, the improvement in terms of trade, show that the oil sector in Libya is smaller when valued at constant import prices and that spread effects in this country depend more on export prices rather than on export quantities. It would be, of course, absurd to disregard the price effect of oil exports when the rest of the world is expressing great concern about the continuous rise in these prices and when a real export price rise (i.e. relative to the price of imports) represents a rise in real income and theoretically could generate its own sequence of spread effects.

To suppress the component effect the contribution of the oil (i.e. mining) sector from GDP has been excluded and the changes in the output of the re-maining sectors (i.e. GDP minus oil) were regressed on changes in oil exports. To suppress both the component and the inflationary effects (i.e. the rise in prices which does not represent a rise in real incomes) the deflated value of total non-oil output (i.e. the domestic product -46 of industries other than mining) was regressed on the deflated value of exports (using an import price index with 1963 =100). The following model was tested:

$$In(Y_{non-oil,t}/Y_{non-oil,t-1}) = \beta_0 + \beta_1 In(X_t/X_{t-1}) + \beta_2 In(Y_{non-oil,t-1}/Y_{non-oil,t-2}) + \eta_t \quad 3$$

Where: Y- non_oil = (GDP – Oil) valued at constant import prices
X = Oil exports valued at constant import prices

Table 4. Libyan Oil Exports and Non-Oil GDP (Deflated by Import Price)

The Model: $In(Y_{non-oil,t}/Y_{non-oil,t-1}) = \beta_0 + \beta_1 In(X_t/X_{t-1}) + \beta_2 In(Y_{non-oil,t-1}/Y_{non-oil,t-2}) + \eta_t$						
Periods	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_2$	R2	F	DW
1974-1981	.250	.065	-.369	.31	1.123	2.09
t	1.748	.492	-.545			
1982-1990	.141	.643	.609			
t	.026	-.129	-.014	.08	.418	1.72
1991-1998	.565	-.691	-.034			
t	.592	.515	.974			
1999-2008	.035	.179	.433	.14	.276	1.11
t	.693	.602	.895			
1974-2008	.519	.573	.412			
t	.029	.338	-.162	.15	.629	1.96
Note: * denotes 1 percent level of significance and ** denotes 5 percent level of significance						

Source: author calculations.

The regression results are given in Table 5. These results show that when both the component and the inflationary effects are excluded there is no evidence of spread effects of oil exports to the rest of the economy (non-Oil GDP).

Summary

The conclusions reached in this paper are very significant for understanding the effect oil price changes have on functioning of Libya's economy. The key conclusions are:

In the first place, in regards to impact of oil price changes on economic development of economic sectors in Libya it can be said that;

❏ The rates of growth of all sectors in Libya were significantly higher in periods that demonstrated oil price increase than during periods that the prices had a downward fall. However, throughout the last several years, the overall economic growth of all sectors didn't have any gain from the oil export increase and that might indicate a shortage of opportunities for investing in the last years.

❏ GDP of Libya profited from opportunities created by growth in oil exports. Never the less, the delayed effects are overpowered by the contributions for the current period and that could indicate that the created opportunities for investment are not used to their full capacity.

❏ The increase of exports has caused no response from the real output of all Libyan sectors, except when it comes to trade (wholesale and retail) and other economic activities (including insurance, finance, and other services). On the contrary, the increase in the manufacturing sector has been following a trend that is opposite to the oil exports during the last 40 years.

❏ There is no data to support the claim that a long-term relationship between Libyan GDP and Libyan oil exports exists.

Export of oil is a great part of Libyan exports even though it has experienced great declines in periods when oil prices are low. Oil price changes have also influenced the share merchandise exports have in the country's GDP.

The proportion of the trade balance to GDP has experienced great change in the period from 1974 till 2008 and that behavior can also be assigned to the oil price fluctuations. In the period between 1975 and 2008, the proportion of current account to GDP has also changed immensely.

The data received from the single-equation regression demonstrate a considerable negative correlation between the resource balance and income from non-oil sectors. On the other hand, the growth on the world level creates a considerable positive effect on Libya's resource balance due to its positive effect on exports of oil. These trends show that the growth of non-oil income brings an increase in imports.

Data from the simultaneous-equations model results show that the non-oil income serves as a big factor in determining the amount of spending Libya will have for imports. The data also shows that the fluctuations in imports that are a consequence of non-oil income changes are subjected to a partial adjustment mechanism.

The results received from regression show that a the changes in the portion of OPEC world oil supply determine the export of oil by Libya.

The results received from simultaneous-equations model show that between imports and exports there is no considerable feedback effect primarily due to the small size of Libyan imports' contribution to world incomes.

Bibliography

- CASHIN, P., McDERMOTT C. J., I. M. F., (2002), *The Long-run Behavior of Commodity Prices: Small Trends and Big Variability*, Papers, No. pp. 2 SRC – GoogleScholar, pp. 175-199.
- DURBIN, J. (1970), *An Alternative to the Bounds Test for Testing Serial Correlations in Least Squares Regression*, Econometrica, 3, pp. 1. 8 – 2 SRC – GoogleScholarm pp. 19-127.
- FARRAR, D. E., GLAUBER R. R., (1967), *Multi-collinearity in regression analysis: the problem revisited*. Review of Economics and Statistics 49, pp. 92-107.
- GHOSH, A. R., OSTRY J. D., (1994), *Export instability and the external balance in developing countries*, p. 165.
- JOKSIMOVIC, M., ISHNEEN, N., (2017), *Change the oil prices shocks like interaction between the libyan economy and the economies of it's main trading partners*, Book of abstracts International Scientific Conference Regional development and cross-border cooperation, City of Pirot, Faculty of Management in Zajecar, Belgrade Metropilitan University and Chamber of Economy Pirot, Faculty of Management in Zajecar, Belgrade Metropilitan University, Pirot, 2017, p. 33.
- LJUBIC, M., ISHNEEN, N., NESTOROVIC M., (2016), *Influencechange in value of oil on the international market*, Economic and Social Development 14th International Scientific Conference on Economic and Social Development, Book of Proceedings, ISSN 1849-7535, Belgrade, 13-14 May 2016, Editors: Ana Jovancai Stakic, Petar Kurecic and Damir Dobrinic, Varazdin Development and Entrepreneurship Agency, Varazdin, Croatia University North, Koprivnica, Croatia John Naisbitt University, Belgrade Serbia, pp. 23-34.
- KOYCK, L. M. (1954), *Distributed lags and investment analysis*. Vol. 4: North-Holland Publishing Company Amsterdam, p. 145.
- MAITAH, M., ZIDAN, K., ISHNEEN, N. (2013), *The Utilizing of Financial Analysis in Credit Decision in Palestinian Commercial Banks*. International Research Journal of Finance and Economics, (116), pp. 23-30.
- MASSELL, B. F., (1990), *Concentration and instability revisited*. Journal of Development Economics 33 (1), pp. 145-147.
- METWALLY, M., TAMASCHKE H., (1980a), *Oil exports and economic growth in the Middle East*. Kyklos 33 (3), pp. 499-522.

- METWALLY, M. M., (2004), *Determinants of aggregate imports in the GCC Countries*. Applied Econometrics and International Development 4 (3), p. 267.
- RAM, R. (1987), *Exports and Economic Growth in Developing Countries: Evidence from Time-Series and Cross-Sectional Data*, Economic Development and Cultural Change, pp. 5. 26 (1 SRC – GoogleScholar), 1-72.
- SEVERN, A. K. (1968), *Exports and economic growth: comment*. Kyklos 21 (3), pp. 546-548.
- SRINIVASAN, T. N. (2001), *Trade, Development and Growth*, Princeton Essays in International Economics. 26 (2 SRC – GoogleScholar), pp. 134-149.
- SYRON, R. F., WASSU, B. M. (1968), *The Relation of Exports and Economic Growth*, Kyklos, 2, pp. 1 (3 SRC – GoogleScholar), pp. 201-216.
- TAMACHKE, H. U., LONDON, J. K. (1979), *Exports and Economic Growth: Applications of the Staple 77zeo*, Publishers, p. 138.
- WATKINS, M. H. (1977), *The Staple Theory Revisited*, Journal of Canadian Studies, pp. 5 (2 SRC – GoogleScholar), pp. 227-240.

Wpływ zmian cen ropy naftowej na wzrost gospodarki libijskiej

Streszczenie: Celem niniejszego artykułu jest ukazanie wpływu wstrząsów cen ropy na główne składniki bilansu płatniczego. Ważne jest, aby przyjrzeć się trendom cen ropy naftowej w tym okresie. Autorzy artykułu analizują wpływ zmian ceny ropy naftowej na libijski wzrost gospodarczy. Na podstawie dostępnych danych z zakresu czasowego 1970-2008 przedstawiono przegląd danych dla gospodarki libijskiej ze szczególnym uwzględnieniem roli ropy naftowej.

Słowa kluczowe: cena ropy naftowej, bilans płatniczy, wzrost gospodarczy, eksport

JEL: G10, A10, G20