

# Effects of Oil and Non-Oil Exports on the Economic Growth of Syria

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**Abstract** *This study investigated the role of oil and non-oil exports in the Syrian economic over the period 1975-2010. The ADF unit root test, Johansen cointegration test, Granger causality test, impulse response functions (IRF), and variance decomposition (VD) analysis were used in this study. The cointegration test indicates that GDP is positively and significantly related to oil and non-oil exports. The Granger causality test indicates bidirectional short-run causality relationships between GDP, oil exports and non-oil exports. There are also bidirectional long-run causality relationship between non-oil exports and GDP, and unidirectional long-run causality relationship running from oil exports to GDP. The study result indicates that oil exports have the biggest effect on the GDP, thus we suggest encouraging non-oil export and increase its diversity.*

**Key words** Syria, economic growth, oil exports, non-oil exports, VAR

**JEL Codes:** O11, E20

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## 1. Introduction

Exports can play an important role in promoting economic growth through supplying the state budget with earnings and foreign currency that can be used for improving infrastructure and creating an attractive investment climate. Moreover, Export growth leads firms to increase their output and reduce their cost of production, which increases the productivity of these firms and achieve economies of scale. Besides, it plays an important role in expanding the size of the local market and increasing the degree of competition that leads the country to improve its production and use new technology in its production process.

In the same way, exports are an essential component in the national income of Syria and it has an important role in supporting the national economy. However, crude oil has the biggest percentage share of Syrian exports. The two thirds of Syrian foreign exchange earnings come from the oil sector (El-Quqa *et al.*, 2007). However, Syrian oil production has been declining since 1996, due to a depletion of oil reserves in Syria. According to the United States Energy Information Administration (2011), oil production was about 20000 bbl/d in 1968, then it increased continuously to 582000 bbl/d in 1996 (the Syrian oil production peaked), but from 1996 oil production has declined continuously to 407000 bbl/d in 2005 and

387000 bbl/d in 2010. The fall in oil production leads the government to reduce oil exports and increase non-oil exports (SIA, 2009).

However, the war which started in 2011 has caused a huge damage to the Syrian economy. Investment has declined, the deficit in the trade balance has increased, and many oil wells were controlled by the terrorists (SCPR, 2014). Given this backdrop, the main objective of this study is to test the effect of oil and non-oil exports on the Syrian economy from 1975 to 2010, which may assist Syrian policy maker, after the war, to develop an economic plan that takes into account the effect of oil and non-oil exports on the Syrian economy.

## 2. Literature review

Many studies have tested the effect of oil and non-oil exports on economic growth of different countries. The findings from these studies tend to vary from one country to another. Aljarrah (2008) found that non-oil export has a positive effect on economic development in Saudi Arabia. Olurankinse and Bayo (2012), Ude and Agodi (2014) and Ifeacho *et al.* (2014) found that non-oil export has a significant positive relationship with the economic growth of Nigeria, which indicates that the rise in the non-oil export leads to a significant improvement in the Nigerian level of economic development. Adenugba (2013) also found that non-oil exports have a positive effect on the economic growth of Nigeria, but it has performed below expectations. However, Akeem (2011) and Abogan (2014) concluded that the relationship between non-oil exports and economic growth in Nigeria is positive and insignificant. Besides, Mehrara (2014) found that non-oil trade does not have any significant effects on economic growth of 11 oil exporting countries. Merza (2007) found that there is a bidirectional causality relationship between oil exports and economic growth, and there is a unidirectional causality relationship running from non-oil exports to economic growth in Kuwait. Hosseini and Tang (2014) concluded unidirectional causality relationship moving from oil and non-oil exports to economic growth, but oil export has a negative effect on the economic growth of Iran. However, Mehrabadi *et al.* (2012) found that both oil and non-oil exports have positive effect on the economic growth of Iran. Esfahani *et al.* (2013) also found a positive effect of oil revenues on the Iranian economy. Similar results are reported by Esfahani *et al.* (2014) for major oil exporting countries. However, Delacroix (1977) supposed that the exports of raw materials do not help in economic growth. If the country does not use the raw materials in the industrial process it will stay underdeveloped. So using raw materials in the industry will help in economic growth and will lead to developing the country.

Other studies tested the relationship between exports and economic growth. Some of these studies concluded that there is a positive relationship between exports and economic growth. This result is supported by Tyler (1981), Balassa (1985), Ram

(1987), Krueger (1990), Sengupta and Espana (1994), Al-Yousif (1997), Shirazi and Abdul-Manap (2004), Alhajhoj (2007), Hye and Bel Haj Boubaker (2011), and Saad (2012). Some other researchers such as Husein (2009) and Hamuda *et al.* (2010), and Hye (2012) concluded that there is a bidirectional causality relationship between exports and economic growth. However, Al-Suwaidi and Al-Shamsi (1997), Temiz and Gokmen (2010), Safdari *et al.* (2011), and Abbas (2012) found that there is a positive and unidirectional causality relationship running from economic growth to export. Other researchers including Holman and Graves (1995), Xu (2000), Bouoiyour (2003), Bahmani-Oskooee *et al.* (2005), Cetintas and Barisik (2009), and Mehrara and Firouzjaee (2011) found that exports lead growth.

### 3. Methodology of research

The vector autoregression (VAR) model will be used in this study. Our model consists of three variables: the gross domestic product (GDP), oil exports (OX), and non-oil exports (NOX) of Syria. GDP is the dependent variable. The model is presented as follows:

$$\ln\text{GDP} = \alpha + \beta_1 \ln\text{OX} + \beta_2 \ln\text{NOX} + \varepsilon_t \quad (1)$$

where  $\alpha$  is the intercept,  $\beta_1$  and  $\beta_2$  are the slope coefficients of the model,  $\ln\text{GDP}$  is the natural log of the real gross domestic product (in millions of SYP),  $\ln\text{OX}$  is the natural log of real oil exports (in millions of SYP),  $\ln\text{NOX}$  is the natural log of real non-oil exports (in millions of SYP), and  $\varepsilon_t$  is the error term.

The analysis began with the unit root test to determine whether the time series data were stationary at levels or first difference. The unit root test was conducted on each variable in the model, namely, GDP, OX and NOX. The Augmented Dickey Fuller (ADF) unit root test was used to test for the stationarity of the variables. After determining the order of integration of each of the time series, and if the variables were integrated of the same order, the Johansen cointegration test was used in this study to determine whether there is any long-run or equilibrium relationship between GDP and the other independent variables in the model. If the variables were found to be cointegrated, the vector error correction (VEC) model would be estimated to model the short-run dynamics. Then, the Granger causality tests, based on the VECM, were conducted to determine the causality relationships among variables. Furthermore, the VECM would be subjected to the statistical diagnostic tests, namely, normality, serial correlation, heteroskedasticity and Ramsey RESET tests to ascertain its statistical adequacy. Lastly, impulse response functions (IRF) test and variance decomposition (VD) analysis were used in this study to help in determining

whether the independent variables play any important role in explaining the variation of GDP at short and long forecasting horizons. This study uses annual time series data of Syria during the period from 1975 to 2010. This data collected from the Central Bureau of Statistics in Syria. All variables in this study are in real value. Besides, all data will be expressed in the logarithmic form.

#### 4. Empirical Results and Discussion

In the first step of the analysis, we will use the ADF unit root test to identify which variables in the models have a unit root. In other words, we would like to determine whether variables in the models are stationary or non-stationary. If the time series are not stationary at the level, the ADF test is performed on the first differenced series. It is clear from Table 1 that all the variables are not stationary at the level, but become stationary after the first differencing at either the 5% or 1% level of significance. This means that all variables are I(1).

Table 1. ADF unit root test results

	Level			First difference		
	Intercept	Trend & intercept	None	Intercept	Trend & intercept	None
lnGDP	0.726	-2.111	3.695	-6.998**	-7.367**	-1.468
lnOX	-0.616	-2.726	1.285	-6.471**	-6.390**	-6.172**
lnNOX	-0.249	-2.389	2.297	-5.478**	-5.406**	-4.817**

**Note:** \*\* Denotes significance at the 1 per cent level, and \* at the 5 per cent level.

##### 4.1. Johansen Cointegration Test Results

After determining that all the variables in the model are stationary in the first difference, we run the VAR model to determine the optimal lag length, then the Johansen cointegration test will be used to determine if there is any cointegration or long-run relationship among the variables. The optimal lag length selection is 3 lags based on the AIC. The result of the Johansen cointegration test shows that there is only one cointegration equation based on the trace and maximum eigenvalue tests (see Table 2). In other words, the results indicate that there is a long-run relationship between lnGDP, lnOX and lnNOX.

Table 2. Johansen cointegration test results

No. of CE(s)	Trace Statistic	Probability	Max-Eigen Statistic	Probability
r = 0	42.03724***	0.0078	26.32089**	0.0130
r ≤ 1	15.71635	0.1881	8.671721	0.4698
r ≤ 3	7.044627	0.1241	7.044627	0.1241

**Note:** \*\*\* Denotes significance at the 1 per cent level, and \*\* at the 5 per cent level

After having found a cointegration relationship among the variables lnGDP, lnOX and lnNOX, the cointegrating equation was normalized using the real GDP variable.

Table 3. Cointegration equation normalized with respect to GDP

lnGDP	lnOX	lnNOX	C
1.000000	-0.203767 (0.07196)	-0.154849 (0.05946)	-10.71999 (0.25711)

From the Table 3, the long-run lnGDP equation can be written as:

$$\ln\text{GDP} = 10.71999 + 0.203767 \ln\text{OX} + 0.154849 \ln\text{NOX} \quad (2)$$

The cointegration equation above shows that GDP is positively related to the oil and non-oil exports. For every one percent increases in oil and non-oil exports, the GDP will increase by 0.20 and 0.15 percent, respectively. This suggests that oil and non-oil exports support the economic growth in Syria. An increase in exports (oil and non-oil exports) provides the government with earnings and foreign currency to import the requirements for development, in addition to providing funds that can be used to improve infrastructure, and for creating an attractive investments climate, which help in supporting the Syrian economy. This finding agrees with the results obtained by Mehrabadi *et al.* (2012), Olurankinse and Bayo (2012), Ude and Agodi (2014), and Esfahani *et al.* (2014).

#### 4.2. Granger Causality Tests Results

After having identified the existence of a long-run relationship among the variables, in this section, the results of the short and long run causality relationships among the variables based on the vector error correction model (VECM) were shown. The F-test results show the significance of the short-run causal effects, while the [ect(-1)] shows the long-run causal effect. It is clear from Table 4 that there are bidirectional causality relationships between lnOX, lnNOX and lnGDP in the short run. But in the long run, there are bidirectional causality relationship between lnNOX and lnGDP, and unidirectional causality relationship running from lnOX to lnGDP.

Table 4. Granger causality test results

	Independent variables			
	$\sum \Delta \ln\text{GDP}$	$\sum \Delta \ln\text{OX}$	$\sum \Delta \ln\text{ED}$	ect(-1)
$\Delta \ln\text{GDP}$	-	3.938478(4)**	2.657295(3)**	-1.931411*
$\Delta \ln\text{OX}$	3.600792(5)**	-	1.327643(3)	-0.063373
$\Delta \ln\text{NOX}$	3.643871(4)**	1.214486(2)	-	-2.546415**

**Notes:**  $ect(-1)$  represents the error correction term lagged one period. The numbers in the brackets show the optimal lag based on the AIC. D represents the first difference. Only F-statistics for the explanatory lagged variables in first differences are reported here. For the  $ect(-1)$  the t-statistic is reported instead. \*\* denotes significance at the 5 per cent level and \* indicates significance at the 10 per cent level.

#### 4.3. Statistical Diagnostic Tests Results

The VECMs will be subjected to a number of diagnostic tests, namely, the normality, serial correlation, heteroskedasticity (BPG and ARCH) and Ramsey RESET tests. A 5% level of significance will be used in all these tests. Table 5 show that the VECM with  $\ln GDP$ ,  $\ln OX$ , and  $\ln NOX$  as the dependent variables pass the normality, serial correlation, heteroskedasticity (BPG and ARCH) and Ramsey RESET tests.

Table 5. Results of the statistical diagnostic tests on the VECM

The Depended Variables	$\ln GDP$	$\ln OX$	$\ln NOX$
Normality tests	0.546101	0.631631	0.61274
Serial correlation tests	0.2402	0.4723	0.5022
Heteroskedasticity (BPG) test	0.4912	0.3962	0.4821
Heteroskedasticity (ARCH) test	0.4557	0.5214	0.4901
Ramsey RESET tests	0.6101	0.5303	0.4861

**Note:** \*\* Denotes significance at the 1 percent level, and \* at the 5 per cent level

#### 4.4. Impulse Response Functions (IRF) Test Results

Impulse response functions (IRF) allow us to study the dynamic effects of a particular variable's shock on the other variables that are included in the same model. Besides, we can examine the dynamic behaviour of the times series over ten-year forecast horizon. Figure 1 shows that when there is a shock to  $\ln OX$  or  $\ln NOX$ ,  $\ln GDP$  responds positively, but the impact of the shock to  $\ln OX$  dies down gradually, which fit with the government's strategy to reduce oil exports and increase non-oil exports.

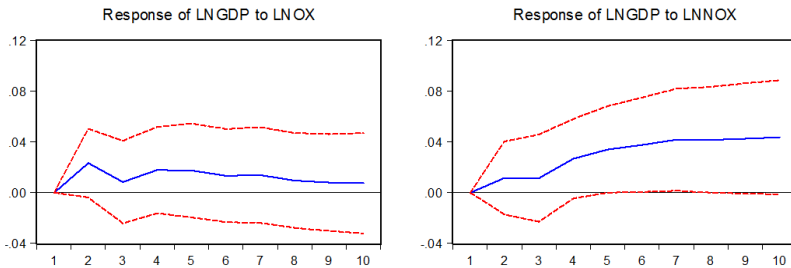


Figure 1. Impulse response functions (IRF) results

#### 4.5. Variance Decomposition (VD) Analysis Results

The variance decomposition (VD) for 1-year to 10-year forecast horizons will be applied in this study. The VD concerns to the extent to which variables are dependent on each other, and it provides information about the relative importance of each random innovation in affecting the variables in the model during the forecast horizon. In other words, The VD indicates the amount of information each variable contributes to the other variables in the autoregression. It determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables. The forecast error variance decompositions of the variables in our model are given in Table 6. In the first year, the error variance of GDP is exclusively generated by its own innovations and has been decreasing since then for the various forecast horizons. However, at the 10-year forecast horizon, its own shocks contribute about 39% of the forecast error variance. On the other hand, lnOX and lnNOX shocks explain 23% and 38% respectively of the forecast error variance of GDP. Furthermore, the contributions of lnOX and lnNOX in explaining lnGDP forecast error variance have increased during the 10-year forecast horizon.

Table 6. Variance decomposition (VD) analysis results

Period	S.E.	lnGDP	lnOX	lnNOX
1	0.059760	100.0000	0.000000	0.000000
2	0.074339	87.76693	0.165486	12.06758
3	0.079507	86.09247	0.543894	13.36363
4	0.089895	76.30965	2.424665	21.26569
5	0.098685	65.20638	5.722392	29.07123
6	0.107911	57.10667	9.847500	33.04583
7	0.117897	50.09501	13.64829	36.25670
8	0.126705	45.37585	17.33641	37.28775
9	0.135572	42.00487	20.51921	37.47593
10	0.144097	39.19778	23.26115	37.54107

#### 5. Conclusions

This study investigated the effect of oil and non-oil exports on the economic growth of Syria using annual time series data from 1975 to 2010. The ADF unit root test, Johansen cointegration test, Granger causality tests, impulse response functions (IRF), and variance decomposition (VD) analysis were used in this study. The ADF test results indicate all variables are I(1). The Johansen cointegration test showed that oil and non-oil exports have a positive and significant long-run relationship with GDP. Non-oil exports have the biggest effect on GDP. Furthermore, from the Granger causality tests, we found that there are bidirectional causality relationships between oil and non-oil exports and GDP in the short run. But in the long run, there

are bidirectional causality relationship between non-oil exports and GDP, and unidirectional causality relationship running from oil exports to GDP. The impulse response functions (IRFs) indicated that when there is a shock to oil or non-oil exports, GDP will respond positively in the following years. The variance decomposition (VD) analysis showed that at a ten-year forecasting horizon, oil and non-oil exports shocks explain 23% and 38% respectively of the forecast error variance of GDP, which agrees with the government's strategy to reduce its dependence on the oil sector and making the industrial sector the locomotive of economic growth in the country.

Based on the results of this study, the Syrian government should diversify exports, simplify the export procedures, improve Syrian industry, and increase the percentage share of non-oil exports in total Syrian exports in order to reduce the effect of oil prices fluctuations on the Syrian economy, as well as boosting the quality, productivity, and competitiveness of the Syrian products in global markets.

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