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# Impact of Oil Prices Volatility on Economic Activities in the MENA Countries

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**ABSTRACT**

This article studies oil price impact on economic growth. So, we shall use two samples namely, oil-exporting and importing countries during the period 1980 to 2019. The impact of oil prices on growth would be modeled by a non-linear model and we shall approximate the economic growth from GDP and we would refer to the four explanatory variables: the energy consumption (EC), the rate of inflation (RI), the stock of capital (SC), the balance of energy (BE). We may estimate the developed model by static technique Panel then we discuss the existence of a linear dynamic after testing the presence or absence of homogeneous and heterogeneous unit roots on Panel Data method. The results show a significant relationship between these two factors and groups.

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**List of Abbreviations**
**GDP:** Gross Domestic Product
**EC:** Energy Consumption
**RI:** Rate of Inflation
**SC:** the Stock of Capital
**BE:** the Balance of Energy
**CPI:** Consumer Price Index
**GLS:** Generalized Least Squares Method
**OLS:** Ordinary Least Squares
**FM–OLS:** Fully Modified Least Squares and Vector Autoregression
**OECD:** Organization for Economic Cooperation and Development
**ECM:** The estimated cointegrating vector

## Introduction

The rise in oil prices since 2002 is comparable to that had caused the oil shocks of 1973 and 1979. The price of Brent crude has increased by 5%, exceeding for the first time $ 100 in January 2008. The impact of this dramatic price-increase on growth in the euro area was still relatively low for both economic and structural reasons: the appreciation of the euro since 2002 has cut the rise in oil prices to 50% for the economic actors of the Euro zone (and therefore the impact of the oil price-increase on growth), oil dependence economy has greatly weakened since 1980s, the high taxation of oil derivatives cushions. Paradoxically, the rise in prices of these products is proportional to the sold quantity and not to their unit price and the high competition. In the labor market and on the offered products reduces the risk of inflationary spiral.

Theoretical analysis shows that the rise in oil prices, after taking into account the appreciation of the euro, had a recessionary impact on the euro area economy in 2004, 2005 and 2006. The cumulative cost is included between 1% and 2.2%points of the estimated growth. In 2002, 2003 and 2007, the rise in the oil price ($) has been completely offset by the appreciation of the euro. Typically, during the period of 2002 to 2007, the cost of oil prices increased in terms of growth. It was situated between 0.14% and 0.34%points per year.

Despite major difficulties that could face the forecast scenario in the exchange rate and oil prices, the main empirical studies have shown the importance in forecasting for 2008: the impact of oil prices on growth will be zero in low scenario (average price per barrel to 85 dollars and euro to 1.53 dollars) and between 0.4% and 0.8% points in the high scenario (average price per barrel to 100 dollars and euro 1.47 dollars).

Finally, we analyze the implications of oil prices rise on economic growth. General economic conditions and the moderate impact of oil prices in 2008, on activity and inflation suggest that the European Central Bank should maintain. The neutrality of its economic growth and maintain its constant real interest rates which would imply an increase in its key interest rates.

This article is divided into four parts. In the first section, we shall refer to the main previous work that treated the impact of oil prices on economic growth. In the second section, we shall analyze the quality of variables in our reference model based on the indicators of descriptive statistics. In the third section, we shall estimate this model by the statistical Panel technique. In the fourth section, we shall try to verify the existence or absence of homogeneous-heterogeneous unit roots for different variables describing oil prices impact on economic growth and the equilibrium relationship between these variables and the long-term corrective adjustments.

**Empirical Literature: Review of the Impact of Oil Prices on Economic Growth**

In the 70s, great importance was focused on relationships that have dependencies between variability in oil prices and economic growth. Empirical studies have verified that the pulse shocks in oil prices always generate global economic crises and periods of inflation have prompted numerous studies. Following the study of the transmission of shocks to oil prices to the economy mechanism, many researchers have argued that. In general, there is a link between the fluctuation of oil prices and the economic growth. This theoretical link between growth and the evolution of oil prices has been widely applied and tested using various econometric methods mainly concerning the economy of the United States and other OECD countries. Nevertheless, the analysis of the impact of volatile oil prices on macroeconomic variables is complicated by other major events and the changing economic environment during the period in which price fluctuations occur.

Burbidge and Harrison tested the impact of oil price increase by using a vector auto-regression model of (VAR) to seven variables for five countries (USA, Japan, Germany, UK and Canada) [1]. The Organization for Economic Cooperation and Development (OECD) based on monthly data covering the period of January 1973-June 1996. They made a conclusion that the significant impacts related shocks over the level of oil. General prices were manifested for the US and Canadian economies and had exerted pressure on industrial production in the US and the UK. They also stressed that the 1973 oil crisis had worsened the impending economic crisis at that time. See Jiménez-Rodríguez and Sánchez, Mork and Hall ,Guo and Kliesen, Rafiq et al Du and Wei [2-5].

Mork had developed a further study of Hamilton using a larger sample of data and taking into account the oil price control existed in the 70's [3]. In addition, he studied the possibility of providing an asymmetric response to increase and decrease in oil prices. Theresults show that GDP growth is related to the conditions of the oil market and oil prices downward is not as statistically significant as their rise.

Abeysinghe showed that open economies are being affected by both direct and indirect effects of oil price increases in terms of GDP growth. The level of this growth is based on the status of the economy, whether it is an importer or a net exporter of oil. Abeysinghe made a conclusion that the impact on output growth is higher in small open economies compared with large economies such as the United States [6]. This work revealed that "the real impact of a new shock depends on how it affects consumer confidence and investor."

Recently, Jimenez-Rodriguez and Sanchez undertook a study to assess the impact of oil prices fluctuations on real economic activity [2]. In major industrial countries, OECD members, adopting the VAR approach to multidimensional analysis, with specifications on linear and nonlinear models. Following the example of Abeysinghe, they took into account both the available data on importers and net exporters of oil and found that the real GDP of these two categories (countries) vary in terms of response to oil shocks, except for the United Kingdom (net exporter) and Japan (net importer) [6]. The asymmetric specification (nonlinear) shows that the oil price decline is significant only in some of the countries under review. Furthermore, non-linear models are more accurate and significant results as regards the immediate response functions and the real impacts of the oil shocks. Finally, we see that the oil price-related shocks and monetary shocks are the main cause of volatility of real output.

A number of researchers have examined the inflationary effects of oil shocks. Hooker evaluated the contribution of oil prices changes to inflation [7]. In the United States, using the framework of the Phillips curve and taking into account the asymmetries nonlinear characters structural breaks that have been highlighted in literature on the link between oil prices and the major macroeconomic variables. It is concluded that there is a structural break under which oil price fluctuations have had a significant impact on core inflation before 1980, but have weakened since then. The results in terms of econometrics, as highlighted by Hooker, were strong and very important, using different specifications of the framework of the Phillips curve, the oil price variables, sample periods and specification of delays [7].

According to the work of Gracia-Cunado, the impact of oil price-related shocks on economic activity and inflation are important, but are limited to the short term [8, 9]. If the shocks are transformed in terms of local currency of the country under review, the results would include the most important evidence about the impact of the shocks. The asymmetric response to the link between oil prices and inflation is demonstrated as different case studies, including Malaysia, South Korea, Thailand and Japan.

Another study by Gbatu et al. and Aliyu also found asymmetric effects of oil price in Liberia and Nigeria respectively. Salisu and Isah examined the non-linear relationship between oil price and stock price in oil-importing and oil-exporting countries. They found that stock prices respond asymmetrically to changes in oil prices.See Motunrayo O.Akinsola and NicholasM.Odhiambo [10- 12].

**Database and Models**

In this article, we shall study the impact of oil prices on economic growth. We shall use a database extracted from the World Bank and the International Monetary Fund. This basic data concerns two groups of countries, based on a sample of thirteen countries exporting oil: Algeria, Saudi Arabia, Bahrain, United Arab Emirates (UAE), Iraq, Iran, Kuwait, Libya, Oman, Qatar, Syrian Arab Republic, Venezuela and Yemen during the period of 1980 to 2019.

We shall use the position indicators, dispersion and form database for the sake of analyzing data for Petroleum Exporting Countries. The database would contain five variables: the energy consumption (EC), the inflation rate (IR), the stock of capital (SC), the balance of energy (BE) and gross domestic product (GDP). For the inflation rate, we would refer to the price indices (CPI) and the capital stocks that are focusing on investments directed to that branch.

**Table 1: Descriptive statistics Exporting Countries**

| | GDP | EC | CPI | SC | BE |
|---|---|---|---|---|---|
| Average | 61065.76 | 59.30454 | 3.62 | 13638.2 | -14079.98 |
| Median | 37319.5 | 65.92278 | 1.107 | 5938.647 | -3757.141 |
| Standard deviation | 63721.27 | 41.184 | 1.137369 | 16249.7 | 29315.28 |
| Jarque-Berra | 481.0285 | 29.72214 | 14.286 | 582.2722 | 5495.653 |
| Probability(JB) | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |

Table 1 shows the Descriptive statistics of Exporting Countries. From this table, we notice that the means for the above variables are very high because our database contains very high numbers. Also, the median which divides the increasing cumulative frequency of each variable into two equal parts, one part of the observed values

greater than the median, while the other 50% is below the median value. Hence, the median is the center of the statistical series. We note while referring to this table that the variances are very high for these variables. Hence, it is a poor estimate for these variables because the variance is a dispersion absolute indicator. Also, the standard deviations were very high and the adjustment of each variable with respect to the right adjustment is bad. We can see that the nonlinearity is a dominant character for each variable in our database since statistics Jarque & Berra are greater than the tabulated value of chi-square with two degrees of freedom. We refer to the eight importers of oil countries namely: Egypt. Israel, Jordan, Lebanon, Morocco, Mauritania, Tunisia and Turkey during the period of 1980 to 2019.

**Table 2: Descriptive statistics for importing countries oils**

| | GDP | EC | CPI | SC | BE |
|---|---|---|---|---|---|
| Average | 53601.56 | 52.87494 | 8.7614 | 11653.42 | -915.9343 |
| Median | 23090.53 | 51.63057 | 1.0455 | 5616.073 | 106.126 |
| Standard diviation | 74524.47 | 40.20837 | 2.3605 | 17550.11 | 6294.702 |
| Jarque&Berra | 825.2686 | 26.53264 | 17.73677 | 3000.155 | 8389.282 |
| Probability(JB) | 0.000000 | 0.000002 | 0.000000 | 0.000000 | 0.000000 |

Table 2 shows the Descriptive statistics for importing countries oils. We notice that the averages are very high except for the indices of consumer prices. Quality precision variable subscription data is very poor because the variances are very high. Also, the linear fit of each variable with respect to the average is very bad, since the standard deviations were very high. Statistics Jarque Berra are greater than the critical value of chi-square with two degrees of freedom. Consequently, these variables do not follow the normal distribution.

**Estimates of Static Relationships between Oil Prices and Economic Growth**

We shall study the impact of oil prices on economic growth. For this reason, we refer to the model that links economic growth approximated by the gross domestic product (GDP) compared with the explanatory variables: the energy consumption (EC), the stock of capital or investment to energy (SC), inflation (CPI) and the balance of energy (BE). Our model is typical for exporters and oil importers during the period of 1980 to 2019. Our model is specified from the following nonlinear equation:

$$GDP_{it} = \exp(\alpha_i)\,(\mathrm{CE})_{it}^{\beta_i}\,(\mathrm{CPI})_{it}^{\chi_i}\,(\mathrm{SC})_{it}^{\delta_i}\,(\mathrm{BE})_{it}^{\gamma_i}\,\exp(\varepsilon_{it}) \quad (1)$$

The static estimate of the nonlinear function that connects the gross domestic product compared with the explanatory variables shown above for importers-exporters, on annual frequencies, requires, first, to check the homogeneous or heterogeneous specification data generating process. We shall analyze the effect of oil prices on economic growth for oil importing countries during the period of 1980 to 2019 for a sample of eight oil importers: Egypt. Israel, Jordan, Lebanon, Morocco, Mauritania, Tunisia and Turkey. Our reference model of Abel and Bernanke is specified by the following linear form [13].

$$Log(GDP_{it}) = \alpha_i + \beta\,\mathrm{Log}(\mathrm{EC})_{it} + \chi Log(\mathrm{CPI})_{it} + \delta Log\,(\mathrm{SC})_{it} + \gamma\,\mathrm{Log}\,(\mathrm{BE})_{it} + \varepsilon_{it} \quad (2)$$

The specification tests show that our theoretical model can be formalized as a panel with individual effects. To estimate oil prices on the economic growth of oil importing countries during the period from 1980 to 2019 on annual frequencies, we use the within and GLS techniques. The table below summarizes the two estimation techniques in the observation of static linear equation which describes the relationship connecting the gross domestic product to explanatory variables.

**Table 3: Estimation of the static relationship**

| | Within estimation | | GLS estimation | |
|---|---|---|---|---|
| | $Log(GDP_{it})$ | | $Log(GDP_{it})$ | |
| $Log(EC_{it})$ | -0.1004517 | (0.000) | -0.1430998 | (0.000) |
| $Log(IPC_{it})$ | 0.1110379 | (0.000) | 0.031456 | (0.000) |
| $Log(SC_{it})$ | 0.39808 | (0.000) | 0.4201464 | (0.000) |
| $Log(BE_{it})$ | 0.4057998 | (0.000) | 0.25619 | (0.000) |

**The value in brackets is the significance of each variable**

From table 3, we notice that the estimation, the static relationship, by the within and GLS technique gives expected and significant results. But the consumption of energy variable has a negative and significant effect on economic growth for oil importers. The other variables have positive and significant impact gross domestic product. We find that the coefficients are very low although they are significant. We shall use the Hausman arbitration test (1978) to choose one of these estimation techniques. The table below summarizes the Hausman test (1978) on the impact of oil prices on economic growth for the sample of oil-importers.

**Table 4: Hausman Test**

| Hausman-Stat | | | $\chi^2(4) = 3.37(0.232)$ | | | | |
|---|---|---|---|---|---|---|---|
| Egypt | Israel | Jourdan | Lebanon | Morocco | Mauritania | Tunisia | Turkey |
| 0.865880 | -0.286302 | -0.65589 | -0.203038 | -0.100973 | 0.061421 | 0.202185 | 0.1615 |

We can conclude from table 4, that the impacts of oil prices on economic growth for petroleum importing countries can be modeled by a panel with random individual effects and we then use the GLS technique to estimate this model.

The estimation by the generalized least squares method (GLS) gives the expected and significant results. Gross domestic product is more elastic with respect to the energy consumption. Elasticity GDP of consumption energy significant negative, that is to say, any increase in the energy consumption causes a delay in economic growth and increase of 100% of this consumption leads to slower economic growth in the order of 143%. By cons, other variables are less elastic with respect to economic growth. These elasticizes are positive and significant but the contribution of inflation on economic growth remains modest. The increase in investment generates a 100% increase in the gross domestic product to around 42% and the increase in the balance of the energy of 100% leads to an economic growth rate of 26%. The estimate random effects GLS procedure is presented in the table below:

The random effects or average effects of omitted variables are very low. Hence, it is a good specification of the oil price effect on economic growth. For Egypt, Mauritania, Tunisia and Turkey, the random effects are positive, that is to say the positive impacts of hidden variables are higher than the negative effects of non-explanatory variables. For matted the remaining countries has negative random constant.

In this article, we shall examine the existence of a static relationship that connects the gross domestic product to the energy consumption, the stock of capital, the indices of consumer prices and balance energy for a sample of thirteen petroleum exporting countries during the period 1980- 2019. The petroleum exporting countries are: Algeria, Saudi Arabia, Bahrain, United Arab UAE, Iraq, Iran, Kuwait, Libya, Oman, Qatar, Syrian Arab Republic, Venezuela and Yemen.

Our reference model for oil exporting countries is specified bythe following linear equation:

$$Log(GDP_{it}) = \alpha_i + \beta \text{Log(CE)}_{it} + \chi Log(\text{CPI})_{it} + \delta Log(\text{SC})_{it} + \gamma \text{Log(BE)}_{it} + \varepsilon_{it} \quad (3)$$

We use the Within and GLS techniques to estimate the relationship between the gross domestic product and the four explanatory variables: The inflation rate, the energy consumption, the stock of capital and the balance during the period 1980- 2019 for a sample of thirteen Petroleum Exporting Countries. The estimation of the static relationship that describes the impact of oil prices on economic growth by the appropriate technique is presented in the table below:

**Table 5: Estimation of the static relationship**

| | Within estimation | GLS estimation |
|---|---|---|
| | $Log(GDP_{it})$ | $Log(GDP_{it})$ |
| $Log(EC_{it})$ | -0.3286328(0.026) | -0.1489228(0.141) |
| $Log(IPC_{it})$ | 0.2315653(0.016) | 0.0947725(0.184) |
| $Log(SC_{it})$ | -0.0676212(0.703) | 0.3396976(0.002) |
| $Log(BE_{it})$ | -0.4408724(0.009) | -0.026944(0.780) |

The estimated relationship that describes the impact of oil prices on economic growth through appropriate technique gives the expected results but not significant in most of the explanatory variables. The energy consumption affects significantly and negatively the economic growth from the Within method, that is to say, any increase in energy consumption leads to a reduction in the gross domestic product, but this variable plays negative lyand gives insignificant role in the procedure of GLS. Inflation affects positively and not significantly economic growth by this technique. This result is consistent with Keynesian theory which states that the price increase by an expansionary monetary policy leads to an increase of production and wealth. This variable affect positively and significantly the economic growth Within the estimation. By cons, investment or capital stock has a positive and significant effect on economic growth from the GLS procedure but has a negative and significant effect by the non Within technique. Finally, the energy balance has a negative impact on economic growth by using the two estimation methods and a non-significant effect from the GLS method. We will use the Hausman test to choose between these two estimation techniques. For this reason, the table below corresponds to the Arbitration Hausman test (1978).

**Table 6: Hausman Test**

| **Hausman-Stat** | | | $\chi^2$= 10.55 (0.0321) | | | | |
|---|---|---|---|---|---|---|---|
| **Algeria** | **SaudiArabia** | **Bahrain** | **Iraq** | **Iran** | **Kuwait** | **Libya** | **Oman** |
| 11.40028 | 12.70433 | 13.46453 | 12.35594 | 12.62154 | 12.54028 | 12.36807 | 13.09115 |
| Qatar | Syria | Venezuela | Yemen | UAE | | | |
| 13.08525 | 13.62868 | 13.97054 | 14.30783 | 11.23617 | | | |

Statistic Hausman exceeds the tabulated value of chi-square with four degrees of freedom. Since our model is specified by a panel with fixed individual effects, we choose the Within technique in estimating that studies oil prices on economic growth. We shall use this technique to estimate the fixed effects for the thirteen Petroleum Exporting Countries.

We notice from the previous table that the estimated fixed effects of within procedure gave the expected results but with very high and positive. Hence, the positive effects of omitted variables dominate the negative impacts of non-explanatory variables.

**Linear Dynamics of the Oil Price Effect on Economic Growth**

In this article, we shall examine the presence of unit roots on Panel data for the indicator of economic growth (GDP), consumption of energy (CE), the rate of inflation or price indices for consumption (IPC), investment or capital stock (SC) and the balance of energy (BE). The existence of the unit root is checked for exporting countries and oil importers during the period 1980-2019. We analyze the homogeneous and heterogeneous unit roots for these countries. In the second step, we will discuss the presence of a long-term relationship for each group of countries, while referring to the seven Peter Pedroni tests [14]. In the case where the long term residual is stationary in level from within-Between tests we shall integrate this relationship in an error correction model (ECM) for each group. Finally, we will study the linear deviation of the gross product compared to the fitted line.

This paragraph is split into two parts. In the first part, we study the existence of unit roots in the variables based on our data. In the second step, we estimate the cointegration relationship for each group of countries and we test the stability level of the relationship residue. Also in this paragraph we will detect the presence of a linear fit of this relationship within an error correction model (ECM). The table below corresponds to the unit root test on Panel Data Levin & Lin and IPS for all variables and exporting petroleum importers [15, 16].

**Table 7: Tests of unit roots**

| | | Levin et Lin (2002) | | | IPS(2003) | |
|---|---|---|---|---|---|---|
| | | **Model 1** | **Model 2** | **Model 3** | **Model 2** | **Model 3** |
| $Log(PIB_{it})$ | Exporters | 2.72518 | | | -0.1698 | |
| | Importers | 2.72973 | | | -0.1057 | |
| $Log(EC_{it})$ | Exporters | | 1.41601 | | -0.7690 | |
| | Importers | | 0.67986 | | -0.8483 | |
| $Log(CPI_{it})$ | Exporters | -1.11266 | | | | -0.2376 |
| | Importers | -0.47508 | | | | -0.3936 |
| $Log(SC_{it})$ | Exporters | | | 0.13250 | -0.2334 | |
| | Importers | | | 1.32742 | -0.018 | |
| $Log(BE_{it})$ | Exporters | 2.17750 | | | | -0.5436 |
| | Importers | 1.76721 | | | | -0.2812 |

From the previous table we can notice that the T-static Levin & Lin (2003) test is above the critical value of the normal law reduces center. Hence, the presence of roots is checked for all variables of our reference model. This presence of homogeneous unit roots is detected from this test. But the variables are different depending on the modeling since the logarithms of gross domestic product; inflation and the balance of energy are specified by a model without constant and without linear trend. For cons, the consumption of energy is modeled with no constant linear trend. The investment or capital stock is modeled with constant & with a linear trend. We find that the presence of the homogeneous unit roots is validated from the test of Levin & Lin for all importing and exporting countries of petroleum and show the existence of this type of test for petroleum exporting countries during the years 1980-2019 [15]. Also, we note that the calculated values of statistical IPS are greater than the critical values of the standard normal distribution center [16]. Hence, we affirm the presence of heterogeneous unit roots for importing countries and oil exporters. We study the existence of the long-term relationship for economic price of petroleum and growth for importers and exporters of petroleum during the period 1980-2019 on annual frequencies from seven tests Peter Pedroni [14].

**Table 8: Tests of Peter Pedroni**

| | **Rho-stat** | **v-stat** | **pp-stat** | **Adf-stat** | **Rho-stat*** | **pp-stat*** | **Adf-sta*** |
|---|---|---|---|---|---|---|---|
| Importers | -12.4785 | -0.86061 | 1.87691 | 4.2323 | -7.18846 | -1.77369 | -0.23376 |
| Exporters | 0.70870 | -1.29032 | 0.23565 | -1.9751 | -2.72415 | -2.41984 | -4.22126 |

Under the dimension within, the residue of the cointegration relationship for petroleum importing countries is stationary only by Rho-stat statistic. This residue is not stationary for the three other tests. By cons in the same dimension, the residue of the cointegration relationship for exporters of oil is stable only by Adf-stat statistics and this residue is not stationary from the three other intra-individual statistics. Under the dimension Between, the residue of economic growth in oil-exporting countries is stationary from the three inter-individual statistics. But, the residue of the relationship of the gross domestic product is stable only for the two inter-individual statistics PP & Rho and this residue is not stationary by the ADF statistic.

It should also be noted that Pedroni proposed unit root tests in order to test constraints on the estimated coefficients of the cointegration relationship, that is to say, on the cointegrating vectors [17]. These tests are based on the FM-OLS method which has the advantage to give more robust results than the usual OLS when samples are small. Moreover, the asymptotic distributions of the estimators based on the FM-OLS are unbiased and do not depend on the nuisance parameters. The table below summarizes the estimates by the FM-OLS technique inter vectors and intra-countries of the impact of oil prices on economic growth for the exporting countries and oil importers.

**Table 9: The cointegrantion vector-country importers and exporters of oil**

| | **Importers oils** | | **Exporters oils** | |
|---|---|---|---|---|
| | **Log(GDPit)** | | **Log(GDPit)** | |
| **Variables** | **Coefficients** | **T-Statistics** | **Coefficients** | **T-Statistics** |
| $Log(EC_{it})$ | 0.10 | 2.62 | 0.40 | 19.79 |
| $Log(CPI_{it})$ | -0.06 | -2.30 | 0.07 | 2.89 |
| $Log(SC_{it})$ | 0.51 | 21.88 | 0.20 | 45.73 |
| $Log(BE_{it})$ | 0.23 | 4.89 | -0.55 | -10.86 |

The estimated long-term relationship that describes economic growth as a function of energy consumption, the rate of inflation, investment or the stock of capital and the balance of power for eight oils importing countries is performed by the Fully-Modified technique. This long-term relationship has expected coefficients, less elastic and significant. The GDP for these countries is less sensitive to the consumption of energy. Also, the elasticity of economic growth compared to the inflation rate is less elastic. Hence,

economic growth for these countries is detected from the real indicators and not the monetary ones. The stock of capital does not affect the economic growth since the investment ratio is very low. The role of the balance of energy is also very low in real wealth for these countries. All parameters of our model are significant because the T-statistics are larger than the critical value of Student at the threshold of 5% risk.

The estimated cointegrating vector that connects economic growth for petroleum exporting countries to the four explanatory variables is detected by the method of Fully-Modified. The elasticity is very low and the impact of energy consumption is very modest. Moreover, the price increase does not affect the economic growth and the stock of capital has a marginal effect on the increase of gross domestic product for exporting countries of oil. The balance of energy plays a negative role in the increase of real wealth for these countries. The parameters of our model are significant at the 5% risk since the T-statistics are higher than the tabulated value of Student. The table below corresponds to the ECM for importing and exporting countries oils.

**Table 10: Estimated ECM model for importing and exporting countries oils**

| | Importers oïl | | Exporters oïl | |
|---|---|---|---|---|
| | Log(GDPit) | | Log(GDPit) | |
| **Variables** | **Coefficients** | **T-Statistic** | **Coefficients** | **T-Statistic** |
| Constante | 0.0253912 | 0.79051 | 0.1257 | 2.04302 |
| dLog(GDPit-1) | -0.081144 | -1.03649 | -0.0363 | -0.20327 |
| dLog(ECit) | -0.056408 | -1.94933 | 0.0145 | 0.16909 |
| dLog(CPIit) | 0.015567 | 0.39847 | -2.9999e-03 | -0.04814 |
| dLog(SCit) | 0.0567879 | 0.98752 | -0.0268 | -0.19097 |
| dLog(BEit) | -0.044300 | -1.16220 | 0.0624 | 0.77390 |
| dResiduet-1 | -0.000011 | -0.21280 | -1.7919e-06 | -2.45326 |

The estimated ECM by ordinary least squares (0LS) method gives the expected but not significant results for both samples of exporting and importing countries oils. The speeds of adjustments have significant negative signs only for the petroleum exporting countries group. Hence, there is a corrective mechanism which reduces the deviation of the relationship that studies the impact of oil prices on economic growth for petroleum exporting countries. For cons, the cointegration relationship of gross domestic product according to the energy consumption, inflation rate, the stock of capital and the balance of energy undergoes an error correcting phenomenon, but the speed of adjustment of this relationship has a negative but insignificant sign. Hence, the balance of economic growth for eight of petroleum importing countries is not very important. Deterministic balance for these two samples was not highly significant [18, 19].

## Conclusion

Generally, the impact of oil prices on economic growth has been the core subject of studies for academic purposes and for the resolution of major strategic issues. The issue was the focus of a lot of research, because the shocks of oil prices in the early 70s have evolved both in time and in space (affecting both countries developing and developed countries). Given recent increases in world oil prices and the prospect of continuing this trend of short-term increase, or even beyond, as well as constraints on supply, the impact of related shocks oil prices on the main variables of economic prosperity, as a research subject, remains a relevant question at present. In this article we have tried to study the impact of shocks to oil prices in the main indicators of economic growth in some importing countries and oil exporters. This article has reviewed the existing literature on the subject, and used different econometric techniques particularly static Panel methodology to empirically validate the tanker over the effect on economic growth.

We modeled each cointegrating relationship in an error correction model (ECM) and we studied the linear fit of the deviation from equilibrium. We found that every long-term relationship achieve a balance through a mechanism which brings the target of gross domestic product to a partly stable situation. This assertion is verified through negative and significant sign of linear adjustment speeds.

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**Availability of Data and Materials:** transparency data presented but ready where the process of publishing will be requested (a database extracted from the World Bank and the International Monetary Fund)

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