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**ESTIMATING THE IMPORT DEMAND FUNCTION OF PETROLEUM EXPORTING COUNTRIES (OPEC) USING CO-INTEGRATION PANEL ANALYSIS.****HAMID HAGHNEVIS <sup>a</sup>, KAMBIZ HOJABR KIANI <sup>b1</sup>, ABBAS ALAVI RAD <sup>c</sup>**

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**Abstract:** Evidence shows that economy of Petroleum Exporting Countries relies heavily on oil exports and always a major part of their revenue from oil sales is spent on the imports. Although the imports may cause national production growth and foreign trade, what is important is determining the proportion of the imports and the kind of import goods as a result of this revenue and whether import goods have been effective in economic growth and capacity generation. Limitations on this valuable national wealth and the necessity to achieve stationary (stable) development determine the importance of attitudes change towards currency allocation for the import goods so that fulfilling the needs of present generation does not cause compromising with the future generations about their needs to the revenues from this national resource. This study, regarding the excessive reliance of the oil exporting countries on oil revenues and particularly high effect of this revenue on their trade sector, aims to measure tensions (elasticity) of traditional import demand function as well as tensions in oil revenues of these countries in relation to import demands. To this aim, it is possible to compare the tensions of each member and the whole group using panel data co-integration. To this end, the present study has estimated the import demands of these countries using information about the oil exporting countries related to 1995-2012 and fully modified least squares method and weighted constant effects model. Our results indicate that although the ratio (proportion) of the effect of oil revenues to the imports in each country under study is different, 60 percent of the imports of the exporting countries group depend on their oil revenues.

**Keywords:** Panel Data, OPEC, Co-Integration Panel, Imports, Fully Modified Least Squares Method

## 1. INTRODUCTION

Nowadays, there is no country in the World that can fulfill all of its needs without productions and services of the other countries, even if there exists potential (ability) and facilities this won't be economically cost-effective for any country. On the other hand, experience of many countries show that presence in global markets and taking the advantage of foreign trade benefits, have paved the way for economic development in many developing countries in the recent decades. So the exchange of goods and services between countries based on relative and absolute advantages (merits) is considered as an important aspect dealt with (addressed) in the economy. One of the criteria in evaluating the economic power (strength) of each country is its trade the main components of which are exports and imports. Imports and exports of each country are economic indicators showing the amount of the relationship between that country and global economy (Sameti et al., 2004). Increase in imports, on the one hand, indicates increase in the facilities of the global economy in production of goods and materials and on the other hand, decrease in production (productive) power of the country which imports the import goods (import goods importing country).

Excessive reliance of members of OPEC on oil revenues, especially in foreign trade sector, has increased their environmental risks against shocks inserted on oil price. Evidence shows an increase in oil revenues in these countries leads to an increase in the import demands and inversely, a decrease in oil revenues leads to a decrease in the import demands. Thus, lack of proper consumption and an appropriate strategy to consume (use) this revenue as a major and irreversible capital to import goods in fact is to eliminate (infringe) the rights of posterity and in other words, not to achieve the sustainable development in the countries under consideration.

This study aims to measure the traditional import demand tensions (elasticity) as well as the tension of oil revenues in these countries in relation to the import demand. To this end, it is possible to compare these tensions for each member and the whole group using panel data co-integration method.

## 2. LITERATURE REVIEW

According to Mohsen Khan, limitations of the empirical study on the demand function in developing countries is mainly due to the lack of reliable and sufficient statistics in this group of countries. However, among the studies on the import demand function the following can be mentioned. Hozhabr Kiani and Hasanvand (1997), investigated the long-term relationship (equilibrium) between the variables of the import demand function using

converged (converging) methods and the results indicate that the main variables of Iran import demand function include price ratios, foreign currency (exchange) receipts and international reserves.

Tashkiny and Bastani (2006), in an article where they resolved (separated) intermediate (intermediary) goods, capital goods and consumer goods for the period 2003-2009 in order to estimate the import demand functions, concluded that a one-percent increase in domestic relative prices leads to a -1.2 percent increase in the imports of consumer goods, -0.38 percent increase in the imports of capital goods, and -0.35 percent increase in the imports of intermediate goods. Also, a one-percent increase in gross domestic production (GDP) leads to a 0.61 percent increase in the imports of capital goods and a 0.21 percent increase in the imports of intermediate goods.

Tayyebniya and Ghasemi (2006), in a study titled "Investigating Iranian trade cycles (periods) based on season data for 1970 - 2006, concluded that oil fluctuations play an effective role in creating seven trade cycle in Iranian economy in the period under study and periods of prosperity and recession (boom and bust) which coincided periods when oil price and consequently oil revenues has been in maximum amount of it compared with its preceding and subsequent periods.

Mehrara and Niki Oskui (2006), in an attempt to identify the structural shocks in four countries namely Iran, Saudi Arabia, Kuwait and Indonesia using Blanchardvkah long-term limits and annual data from 1960 to 2003 and impulse response functions and analysis of variance concluded that the effect of the positive shock of oil price on the imports, gross domestic production and price index was positive in all countries and increased them.

Azizzadeh (2006), in a study to estimate the price and revenue (income) tensions of import demands for capital goods in Iran by means of ARDL technique during the years 1959-2001 concluded that there is an inverse relationship between the imports of capital goods and relative prices and a direct relationship between the imports of capital goods and the variables GDP without oil and government development budget, also this study shows that imports of capital goods relative to relative prices with tension and of GDP without oil and government development budget is without tension.

Jamenz and Sanchez (2005), investigated the effect of oil shocks on real GDP growth in selected OECD countries. They run (implemented) a multi-variable VAR model using variables GDP, effective foreign currency (exchange) rate, oil price, wage, inflation, short-term and long-term productivity rate for the period 1972 to 2001. The results show that in

all countries under consideration, oil price fluctuations do not directly influence GPD, but indirectly and through other economic variables influence GPD.

Kunadv and García (2005) studied the effect of oil shocks on economic activities and consumer price index for six Asian countries from 1975 to 2005. They found that oil shocks have dramatic and asymmetric effects on both economic activities and consumer price indices. Also, when oil monetary shocks are considered based on each country's currency, these effects are more severe (serious).

Badyr (2006) investigate the dynamic and long-term relationship between real imports and exports in Pakistan using Pakistan annual data from 1973 to 2005, also this hypothesis that imports of capital and intermediate goods play a role as constituents and vital elements (factors) in export products was tested, and empirical evidence suggests that ratio of the long-term tension of export to import is 37 percent. However, this effect appeared with delay, the share (proportion) of raw and capital goods in total exports performance was respectively 24 and 16 percent. As a result, however imports of raw and capital goods have played a major role in increasing the total exports, exports were more sensitive to imports of raw goods than capital goods (perhaps this result is related to the placement of several items in order to determine the variable of capital goods). The tension coefficient of capital goods suggests that it is not possible to increase the level of exports through imports of capital goods for industrial exports which have an industrial potential capacity but due to capacity constraints are not practical. Reduction in the deficit trade can be achieved through interest rate and appropriate foreign currency (exchange) policies, instead of import restrictions with tariff barriers. Overall, the findings of this study suggest that any short-term divergence in the trade balance from intermediate and capital imports and industrial exports can be directed to the importable surplus goods in the long run.

Jalai and Horri (2006), investigated the behavior of the real currency rate in Iran in the years 1959 to 2004. They found that oil revenues, due to their specific characteristics in Iran economy, lead to a decline in real currency rate in the short run, but in the long run due to their impact on the society's demand, increase real currency rate.

Alavi Rad and Dehghan (2006) in a study, aimed at investigating the effect of oil price fluctuations on Iran's imports, concluded that, apart from the domestic income and relative prices, other factors have an impact on Iran's import demand function.

### 3. MODEL, DATA AND ECONOMETRIC METHODOLOGY

#### 3-1. MODEL

Although the most traditional method to obtain the import demand function is maximizing the utility with the assumption that integrative (collective) utility is a function of the productions of each country and the other countries from which the country import goods, Hemphil and Mouran in the studies done separately confirmed that the imports of oil-producing countries also depend on the currency reserves and oil revenues. Also, several studies have shown that oil revenues impact the imports of oil-producing countries. Accordingly, the present study has investigated the following model in countries which are members of OPEC, adding the oil revenues to the traditional model using panel data.

$$M_t = F \left[ Y, \frac{P_m}{P_d}, OR \right]_t, t = 1990 - 2012$$

This formula can be rewritten as:

M Total Import

$\frac{P_m}{P_d}$  Relative Price

Y Incomes

OR Oil Revenues

Thus, if the above mentioned function is written in a log form, the following equation is obtained:

$$M_t = A \left[ \frac{P_m}{P_d} \right]_t^{\alpha_1} Y_t^{\alpha_2} OR_t^{\alpha_3}$$

And the general function which can be estimated is as follows:

$$\ln M_t = \alpha_0 + \alpha_1 \ln \left[ \frac{P_m}{P_d} \right]_t + \alpha_2 \ln Y_t + \alpha_3 \ln OR_t + U_t$$

Where, i denotes the cross-sections (countries members of OPEC) and t, time.

$$\ln M_{it} = \alpha_0 + \alpha_1 \ln \left[ \frac{P_m}{P_d} \right]_{it} + \alpha_2 \ln Y_{it} + \alpha_3 \ln OR_{it} + U_{it}$$

#### 3-2. DATA

The data relevant to this study have been collected in library form from annual data for the time period from 1990 to 2012 belonging to the oil-exporting countries including Algeria, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arabic Emirates, Ecuador, Angola and Venezuela, through World Bank and bulletins related to the OPEC.

### 3-3. METHODOLOGY

According to the nature of the data, which are a mixture (combination) of the independent and dependent variables related to oil-exporting countries in the years from 1990 to 2012, model estimation was done based on panel co-integration method which is a new approach in econometrics. Panel data is a method to integrate time series and cross-section data where due to corporate (joint) consideration of the variable changes in each cross-section and time, all available data are used. Nowadays, in addition to the traditional attitude of panel data econometrics, there exist new insights in this regard.

#### 3-3-1. New Insights In Panel Econometrics

Panel Time Series (PTS) or unstable (non-stationary) panel econometrics was proposed as an important factor in the economic development with a new approach in the early '90s. Although there are not many texts on this issue and the concepts used in this method are theoretical and there is not much evidence in this regard, using this method is much simpler than the traditional one. In this method, the panel data are firstly divided from the viewpoint of priority of significance in time or sections and then the applicable models are considered for each one.

Table 1. Micro panels (short time) and macro panels (long time) (Retrieved from Pedroni, 2008)

Name	Macropanel	Micropanel
Another name	longitudinal panel	Time series panel
N (groups)	Is usually smaller than 100, data are usually countries or regions	In high numbers and without limitation, data are individuals or firms and households
T (Time)	Is usually greater than 20, the data can be annually, monthly or quarterly	Less than 10 and even sometimes less than 5 and often the data are annual
Asymptotes	Both n and t tend to the infinite and have inclined asymptote	N tends to the infinite and has horizontal asymptote
Parameters	Heterogeneity in the whole group, not just in the fixed effect model, is investigated	To investigate the presence or lack of presence of heterogeneity the fixed effect model is used
Dynamics	They are often obscure and unique dynamics	They are restricted to time delay variables and are homogeneous
Variables	Characteristics they have a unit root and other instabilities such as trend and structural failure	Data are stable
Endogeneity	They are comprehensive (inclusive) and lack a reliable test	They have an instrument (tool) to diagnose the endogeneity among which internal delays can be named
Sections dependency	They have been tested and adapted by their structure has not been analyzed	They are assumed as independent, except for Sections
estimators	MG,CCEMG,AMP,PMG,GM-FMOLS	FE, DiffGMM, SysGMM, Olley & Pakes, Levinsohn & Petrin
Diagnostic tests	Through significance of interruption terms	Through the standard output

From the viewpoint of new theory of macro panels, two issues are raised:

I. Mixed regressions (Pooled) in which the parameter homogeneity is rejected. In other words, the regression is heterogeneous (Pesaran & Smith, 1995).

II. Non-stationary, spurious regressions and co-integration

- Time series fully revised estimate techniques have been added to the fixed effect and random effect methods which are used in within-group dependence, autocorrelation and heterosk elasticity in interruption terms.

- There exist several tests for unit root test and panel co-integration test which are addressed in the following sections.

#### 3-3-2. Old Views On Panel Econometrics

In this attitude, according to the main model of the panel data, the model and its estimators are recognized (identified) using the various tests. At the end, if the regression slope (gradient) is fixed (constant) at each section and the fixed terms changes from one section to another or in other words if time effect is not significant and just there is a significant difference between various sections, and coefficients of the sections do not change with time changes, the model is fixed effect. While, in the unilateral (one-way) fixed effect model, the slopes are constant but the constant terms are different in different times and in fixed (constant) two-way effect model, the slope of the functions is constant in each section but the constant term (abscissa) will vary with time and with the section. Seemingly unrelated regression (SUR) is

another type of fixed effect model in which the constant terms and the slope of the regressions are different. But if the variables have been selected randomly, and there is no correlation between explanatory variables and correlation errors, to obtain efficient and consistent estimates, the random effects model can be used.

### 3-3-2-1. DIAGNOSTIC TESTS

#### 3-3-2-1-1. CHOW TEST

To determine the type of the model used in combined data, different tests are used. The most common one is Chow test used in the fixed effects model versus (against) the combined data estimated model (POOL).

#### 3-3-2-1-2. HAUSMAN TEST

Hausman test is used in the fixed effects model versus (against) the random model.

#### 3-3-2-2. LM TEST

LM test is used in the fixed effects model versus (against) the random effect model against Pool model.

In the present study, applied analysis based on cross-sectional data and time series data on the data related to the countries members of OPEC over the period 1990 to 2012 has been done. Considering the length of time period and the number of sections from the viewpoint of integrated data domain, the topic fits with the longitudinal panel. Accordingly, econometric methodology in this article includes some basic parts. Firstly, the degree of model variables is determined using panel unit root tests. Four various types of unit root tests are used to check the reliability of the variables which are as follows:

- Levin Test, Lin and Chu (2002)
- Im Test, Pesaran and Shin (2003)
- Fisher Augmented Dickey Fuller Test, (1999)
- PP- Fisher Test

The basic premise of LLC Test is the existence of a unit root process between the sections, while the IPS test allows the possibility that there exists heterogeneity among individual effects, and this is why the IPS test is called heterogeneous panel unit root test.

Examining the existence of variables co-integration in the combined data is also important like time-series data. When there is evidence of the existence of a unit root in the data, to avoid the occurrence of spurious regression and to determine the long-term relationship between the variables, co-integration method can be useful. Several tests with a completely different framework have been proposed to test the co-integration, among which Pedroni test (2004) and Kao test (1999) can be named.

Pedroni co-integration test uses the estimated residuals and residuals from the long-term regression and its general form is as follows:

$$y_{it} = \alpha_i + \delta_{it} + \beta_{1i} X_{1it} + \beta_{2i} X_{2it} + \dots + \beta_{mi} X_{mit} + \varepsilon_{it}$$

Where  $i = 1, 2 \dots N$  for each part of the model and  $t = 1, 2 \dots T$  refers to the time period, and  $m$  refers to the number of explanatory variables.  $\alpha_i$  and  $\delta_i$  allow the possibility to examine the specific effects of the parts (sectors) and also certain procedures.  $\varepsilon_{it}$  is the estimated residuals from long-term relationships. In order to detect long-term relationships between the variables, Pedroni examined the statistical significance of  $\gamma_i$  by (through) equation (2):

$$\hat{\varepsilon}_{it} = \gamma_i \hat{\varepsilon}_{it-1} + u_{it}$$

In this expression  $\varepsilon$  is the residual obtained from estimating the model (2). Pedroni introduced seven different statistics in two distinct groups to examine and test the null hypothesis of the lack of existence of integration vector in heterogeneous panels' models. The first group of tests is known as intradimensional and takes the common time factors into account. This tests group provides an opportunity to assess heterogeneity within sectors. The next group is called interdimensional and allows the possibility to assess heterogeneity between sectors. Based on this, the seven statistics used by Pedroni for panel co-integration test are:

The first group, the statistics of intradimensional test:

1. Panel -Statistic  $\gamma$
2. Panel Phillips - Perron type P -Statistic
3. Panel Phillips - Perron Type t-Statistics
4. Augmented Dickey - Fuller (ADF) Type t-Statistic

The second group, the statistics of interdimensional test:

1. Group Phillips - Perron Type p- Statistic
2. Group Phillips - Perron t- Statistic
3. Group ADF Type t- Statistic

Kao (1999) has proposed Augmented Dickey - Fuller (ADF) co-integration test with the assumption that the co-integration vectors are homogeneous in each section as follows:

$$\hat{e}_{it} = \gamma \hat{e}_{it-1} + \sum_{j=1}^p J_j \Delta \hat{X}_{i,t-j} + v_{i,tp}$$

Where  $e_{it}$  is the estimate error of long term relationship with combined data method,  $p$ , number of delays in ADF test the size of which depends on the elimination of autocorrelation between the error components. Also,  $J_j$  is variable coefficient of the test delays difference and,  $tp$  is  $V_i$  of the estimated equation error. In other words, in this test, like DF  $\gamma$  and DFt tests, after estimating the long-term relationship, estimate error is calculated and then ADF test is performed using the above equation. The

hypotheses of this test are similar to  $DF_\gamma$  and  $DF_t$  test and the test statistic has standard t distribution.

The final aim of panel co-integration tests is to answer the question “whether there is a long- term relationship or not? Assuming that the existence of panel co-integration assumption is confirmed, the next step is to estimate the panel co-integration vector. In recent years, limited approaches have been used to estimate the panel co-integration vector. The first approach is using the modified least squares method (FMOLS) proposed by Pedroni (2000) to estimate the long-term relationships of panel co-integration.

**4. EXPERIMENTAL RESULTS**

**4-1. PANEL UNIT ROOT TEST**

The power of Panel unit root test is by far more than the same test in time series, but considering the point that there is a possibility of conflict in various unit root tests, all tests have been considered. In general, the usual unit roots tests, such as Dickey-Fuller (DF), Augmented Dickey -Fuller (ADF) and Phillips - Perron (PP), which are used for a time series, are of low test power and have a bias towards

accepting null hypothesis. When the sample size is small ( $n < 50$ ), it becomes more serious (worse). One of the methods that have been proposed to solve this problem is to use panel data to increase the sample size and the unit root test in panel data.

In continuation of reliability, GDP log (Lgdp), foreign currency (exchange) revenues from oil sales (Loil), relative prices (Lp) and imports (Limp) have been studied. To this end, five methods of the most important unit root tests with panel data have been used, however, the different methods of unit root tests based on panel data may give conflicting results. These methods include:

- I. Levin, Lin and Chu test (LLC)
- II. Im, Pesaran and Shin test (IPS)
- III. Fisher –ADF tests
- IV. Fisher -PP by Madala and Wu (1999) and Choi (2001)
- V. Hedri test (the null hypothesis of which is contrary to the assumptions of the above tests)

The results of these tests are shown in Tables 2 and 3.

Table 2. Results of unit root tests for the model variables in the levels  
Source: Research Findings based on Eviews software output

	LGDP		LIMP		LP		LOIL	
	Test Result	(P-value)	Test Result	(P-value)	Test Result	(P-value)	Test Result	(P-value)
LLC	0.0000	7.85614-	0.2763	0.59389-	0.1363	1.09706-	0.6580	0.40704
IPS	0.0900	1.34068-	0.9995	3.26719	0.1693	0.95699-	0.9997	3.44663
ADF	0.0006	53.0360	0.9392	14.3141	0.0073	44.1847	0.9995	7.41030
PP	0.0000	107.247	0.9863	11.3489	0.0000	198.644	0.9998	6.88288
HADRI	0.0000	7.66965	0.0000	8.78348	0.0000	8.16238	0.0000	8.91359

According to the results of table 2, the log of GDP variable is at the stationary (stable) level unit root test of the imports log variable, relative prices, the log

of the foreign currency (exchange) revenues from oil sales are done making (taking) a difference once and the results are as follows:

Table 3. Results of unit root tests for the model variables in first-degree difference.  
Source: Research Findings based on Eviews software output

	LGDP		LIMP		LP		LOIL	
	Test Result	(P-value)	Test Result	(P-value)	Test Result	(P-value)	Test Result	(P-value)
LLC			0.0000	8.60846-	0.0081	2.40370-	0.0000	12.1091-
IPS			0.0000	7.83034-	0.0001	3.84982-	0.0000	11.3591-
ADF			0.0000	102.029	0.0001	57.4642	0.0000	144.793
PP			0.0000	226.607	0.0000	75.2434	0.0000	276.618
HADRI			0.0169	2.12307	0.0000	9.79346	0.0000	9.79346

According to the results of Table 3, except for Hedri test, the other tests emphasize the existence of the unit root in all model variables except for GDP log including imports log, relative prices log and the log

of foreign currency (exchange) revenues from oil sales in the first difference, in other words, all model variables except for GDP log are at non-stationary (unstable) level.

#### 4-2. PANEL CO-INTEGRATION TEST

In co-integration analyses, long-term economic relations are tested and estimated. If an economic theory is correct, a special set of variables specified by the theory are linked together in the long run. In addition, the economic theory just specifies the relations as static (long-term) and does not provide information on the short-term dynamics among the variables.

The co-integration tests when using panel data are generally performed with the method

proposed by Pedroni (1999), Fisher (1932) and Kao (1999). Engel - Granger (1987) co-integration test, when the variables of the cumulative regression equation are of first-degree or I(1), is performed based on the stability (stativity) test of residuals of one regression. If the variables are co-integrated, their residuals must be I (0) or cumulative zero-degree. On the other hand, if the variables are not co-integrated, their residuals are not I (0). Pedroni (1999) and Kao (1999) expanded this test for panel data.

Table 4. Results of Pedroni co-integration test  
Source: Research Findings based on Eviews software output

	Test Result	without intercept	
		Test Result	P-Value
In Group	$\gamma$ Panel – Statistic	0.2197	0.773338
	Panel Phillips - Perron type P –Statistic	0.1864	-0.891063
	Panel Phillips - Perron Type t-Statistics	0.0000	-5.929364
Augmented Dickey - Fuller (ADF) Type t-Statistic	0.0472	-1.672682	
Between Groups	Group Phillips – Perron Type p- Statistic	0.8250	0.934543
	Group Phillips – Perron t- Statistic	0.0000	-4.419510
	Group ADF Type t- Statistic	0.0973	-1.297311
Kao co-integration test	ADF Type t- Statistic	0.0000	-7.565655

According to the results of Pedroni co-integration tests, most test statistics (in each case, at least four statistic) strongly reject the null hypothesis of no co-integration vector for all variables. Besides, the result of Kao co-integration test also rejects the lack of co-integration relationship among the model variables at 5 percent level. Thus, according to what Baltaji mentions, it is possible to use panel estimates, despite the fact that the variables were not at a static (stationary) level.

#### 4-3. MODEL ESTIMATION

##### 4-3-1. FROM THE NEW THEORETICAL PERSPECTIVE

According to number of the sections and time series under consideration (study) based on new theoretical perspective, the panel data of the model

under study can be addressed in longitudinal panels group, thus one of the most advanced estimators which has a high efficiency in estimating it, is fully modified least squares 3 method. Table 5 shows the results of the model estimation using (FMOLS) method.

##### 4-3-1-1. ESTIMATING LONG-TERM CO-INTEGRATION RELATIONSHIP WITH (FMOLS) METHOD

Here the long-term relationship between the variables with regard to the import log of oil-exporting countries as the dependent variable and the log of GDP, the log of the relative prices and foreign currency (exchange) revenues from oil sales as independent variables was estimated using FMOLS method. The results are shown in Table 5.

Table 5. Estimating long-term co-integration relationship with FMOLS method (log of imports is dependent variable)  
Source: Research Findings based on Eviews software output

Variables	Coefficients	Standard Deviation	t-statistics	Error
LGDP	0.065695	0.024186	2.716550	0.0072
LP	-0.066794	0.019688	-3.392550	0.0008
LOIL	0.643152	0.037503	17.14946	0.0000

Table 5 shows log tension of imports of Petroleum Exporting Countries (OPEC) with respect to each variable and expresses the issue that 1 percent increase in oil revenues increases the imports of these countries about 0.64 percent. However, a 1 percent increase in GDP only increases the imports approximately 0.066 percent and 1 percent rise in the relative prices decreases the imports approximately 0.067 percent. While all tensions (elasticity) are significant at the 1 percent level.

#### 4-3-2. From The Old Theoretical Perspective

In order to estimate model from the old theoretical perspective, if Chow test result indicates that the model is panel, to determine the fixed (constant) and random effects, Hausman test must be used. According to Chow and Hausman test results, the model is of panel type with fixed effects. Table 7 shows estimation of the fixed effects model.

Table 6. Results of diagnostic panel tests  
Source: Research Findings based on Eviews software output

Test	Error	Statistics	Results
Chow	0.0000	36.125462	panel
Hausman	0.6330	1.717909	fixed effect

Table 7. Results of fixed effects test  
Source: Research Findings based on Eviews software output

Variables	Coefficients	Standard Deviation	t-statistics	Error
C	7.523741	0.801532	9.386706	0.0000
LGDP	-0.069444	0.035043	-1.981704	0.0488
LP	0.047079	0.011106	4.239192	0.0000
LOIL	0.620354	0.034412	18.02741	0.0000

The results of the above table shows that all model estimate coefficients are significant with the highest level of confidence and are in line with expectations. So that a one- percent increase in GDP log and one -percent increase in the log of relative prices leads respectively to a 0.047 percent increase and a -0.069 percent decrease in the log of imports. Also, a one-percent increase in the log of revenues from oil sales brings a 0.62 percent increase in the log of imports.

## 5. CONCLUSION

The main objective of this study was to estimate the tension (elasticity) of import demand of goods on oil revenues, gross domestic income and relative prices in oil-exporting countries. Therefore, based on results of the previous studies in terms of the condition of import demand function in developing countries, especially oil-exporting countries, in this study, adopting Hamphil model, oil revenues variable has been added to the traditional import demand function.

On the other hand, it has been proved that the imports demonstrate each society's consumption pattern and experience shows that oil revenues play an



important role in shaping the import demand behavior in respective countries. Finally, the results of estimating goods import model with regard to the variable of foreign currency revenues from oil export and transition from relative imports demand function in Petroleum Exporting Countries indicated that:

1. Based on the research findings, fully modified least squares method has been used and fixed effects of goods import tension in Petroleum Exporting Countries relative to their revenues from oil sales are respectively 62 and 64 percent.

2. Based on the research findings, the ratio of the tension of goods import in the target statistical population to the relative price is 7 percent, while the ratio the tension of goods import in the target statistical population to gross domestic income based on the fixed effects test is 5 percent and based on fully modified least squares method (FMOLS) is 7 percent.

Estimates done based on both fully modified least squares and fixed effects methods indicate that there is a tension between the imports of Petroleum Exporting Countries and their foreign currency revenues from oil sales. Also according to the error rate, these issues can be raised at 99 percent confidence level.

### 5-1. POLICY RECOMMENDATIONS

Due to an over 60 percent tension of imports on oil revenues and to achieve the sustainable development, it is recommended that:

1. To avoid directing funds from revenues of boom (prosperity) period (including positive oil shocks) to the import of consumer goods, some measures must be taken.

2. Continuous training to amend the country's culture of consumption in order to protect the rights of future generations by all authorities, researchers, professors, and people of their full abilities and facilities.

Due to heavy reliance of economic structure of the Petroleum Exporting Countries on oil revenues, to modulate the stresses from oil shocks on political and climate issues such as El Nino it is recommended that:

1. The fund of foreign exchange reserves is established and strengthened in order to adjust the pressures caused by the oil shocks.

2. Independence of the central bank's monetary policy in order to avoid government intervention in financial monetary policies and obligatory withdrawal from funds stored in the foreign exchange reserves.

Due to a negative tension of about 7 percent of the imports relative to the relative prices, it is recommended that:

Increasing the relative price of the imported consumer goods relative to the domestic ones in order

not to justify the imports and also preventing the damage to the domestic industries and productions through precise monitoring of the consumer goods import even in critical times like flood, earthquake and war.

### 5-2. SUGGESTIONS FOR FURTHER RESEARCH

A. the researchers are recommended to use the discussed model for different types of the imported goods resolving capital, intermediate and cost goods.

B. It is recommended that the discussed model for foreign currency reserves also be included as an independent variable.

C. For future studies, it is proposed that the model be estimated by dynamic least squares method.

D. In order to achieve better results, it is proposed that a longer time interval be used. E. It is recommended that the mentioned model or similar models be estimated for gas OPEC or countries whose income depends on a particular product.

F. It is recommended that the present and proposed mentioned study be examined resolving different types of imported goods.

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