

An Econometric Estimation and Evaluation of the Import Function in the Libyan Economy

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Abstract—This paper attempts to estimate and evaluate the overall import function in the Libyan economy. It is practically to find out the main variables that affect the import behavior in Libya. A double-log transformation method was tested and used to estimate the import function and the main results indicate that: the behavior of Libyan imports seems to be highly affected by the variation in its GDP, relative prices, and partial adjustment of imports. It also, confirms that fluctuation in oil prices has completely upset the import=income relationship in Libya during the periods of decline in oil revenue. Finally, the short-term elasticity of Libyan imports with respect to its income is approximately 1.2, while its long-term counterpart is approximately 3.12.

Index Terms—About import function, import – income relationship, Libya.

I. INTRODUCTION

The state of Libya is a small oil-producing developing economy which located in the North Africa. Libya plays an important role as a member of OPEC in the supply of oil to the world market due to Geological factors (such as the location of onshore oil fields close to Europe) or the merit of its central geographical location between the developed economies in the West and the growing economies of North Africa [1]. However, The rapid and sharp fluctuation in the living standards of the Libyan economy following the oil embargo in 1973, have led to substantial increase in imports because the consumers tried to catch up with what they missed during the years of poverty and because there are indivisibilities and discontinuities in the consumption of particular items [2].

Imports play an important role in determining economic growth and development in Libya, by increasing the domestic supply of goods and services, hence increasing economic prosperity. Imports offer a regular supply of needed capital inputs as well as essential intermediate products. In addition, competitive imports require domestic products to become more efficient and more competitive in both cost and quality than if the economy was closed. Moreover, importing materials not produced domestically, assist the economy in producing a wider variety of finished goods for both domestic consumption and export. According to reference [3], “it takes money to make money; it takes imports to make exports”. Foreign trade is an essential tool of economic growth [4]. It expands the economy choices from

its both side’s exports and imports, and diversity in condition of production. It has been argued that an expansion of imports and exports play a crucial role in determining the GDP growth and the stability of the balance of payment [5]. The remaining part of the paper will progress as follow: After the introduction, section two gives a brief review of literature on import function and section three describes the structure and performance of Libyan Imports. Section four highlights the growth rate of Libyan imports during the period 1975-2008. Specification of the model and Econometric results are given in section five.

II. BRIEF REVIEW OF LITERATURE ON IMPORT FUNCTION

The behavior of the import function has been the subject matter of a number of empirical studies. One may mention the contributions by [6]-[9]. Most these authors have generally assumed that imports depend upon the price of imports in domestic currency, the price of domestically produced substitutes, as well as real income. They emphasize the essential role plied by real income determining demand function for imports.

Authors in reference [6], estimated imports and exports function in order to measure the price elasticities of income of the US economy. They applied double log equations using quarterly and annual data from 1951 to 1966. The empirical result of their study presented that income elasticity of demand for aggregate imports are similar to the other advanced economy but the income elasticity of other countries of demand for exports are very low. Accordingly, the trade balance of the US might have some detritions over the time.

The results of a comparison study of 41 developed show that the elasticity of imports is higher than the elasticity which estimated by Houtheker and Mag 1969 for these countries but on annual data [7]. Moreover, the income elasticity in the US and the UK were statistically significant with positive sign while the elasticity of income in Canada, France, Japan and Switzerland were significant but with negative sign. The elasticity of other cases in their sample has been insignificant. Therefore, their study confirmed Houtheker and Mag findings and added that even some countries grow by same level; they would suffer from the instability of international trade.

Reference [8] shows that an examination of long run relationship of imports function in Venezuela over the period 1953-1972. The model consists of aggregate imports as function of GDP, and relative prices. He found evidence that the majority of changes in Venezuela imports were explained, by the comparative prices and real income. Furthermore, the partial elasticity of imports is higher than total elasticity of

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imports.

Johansen multivariate co-integration method was conducted in order to assess the long run relationship between aggregate imports and main components of final expenditure [9]. It found strong evidence that significant long run relationship between aggregate imports and aggregate expenditure were existed. Moreover, the results suggested that exchange rate policies seem to have insignificant impact on The UK demand for imports.

Most oil producing countries in the Middle East; particularly Libya, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and U.A.E. depend heavily on the outside world for the supply of most of their needs [10]. This is because of the relatively weak productive capacity of these economies, due to the lack of resources, particularly labor, materials and water. Furthermore, it has been concluded that the proportion of GDP spent on imports of goods and services in the majority of Arab countries exceeds 25 per cent. As results, the income-elasticity of import exceeds one in many Middle East countries [11].

Many studies developed econometric techniques and models to identify functional relationships in Middle-Eastern oil producing economies.

It has been argued that in estimating the import-income relationship in the oil producers, one must take into account the real gains from trade that a country enjoys when its export prices increase faster than its import prices [12]. Therefore, using a deflated income in estimate the import function may not be the most right structure in the case of these countries. The demand function for imports for some members of GCCC countries has been estimated [13], [14]. They used a one-period lagged value of imports in the function in order to allow for the partial adjustment of real imports to the desired level. It is reported that the level of actual imports go up whenever there is an excess demand for imports.

Box and Cox analysis of transformation was used in order to select suitable import demand function for the Gulf Council Countries [14]. It concluded that the linear model is the best in cases of Oman and Kuwait only, while log-linear model is the most appropriate form of the UAE, Saudi Arabia and Qatar.

Author in reference [15] examined the long run relationship between exports and imports in Iran over the period 1959-1990. Engle-Granger and Johansen-Juselius co-integration techniques were used in this study. The empirical result shows that Iranian export and imports are statistically integrated.

Johansen multivariate co-integration technique was applied to examine the long run relationship between spending on imports and instability of oil exports in GCC countries [16]. The model included aggregate imports, real GDP, relative prices and lagged one year of imports. The empirical results the study show that aggregate imports of GCC countries have significantly affected by downturn in oil prices. Additionally, it presented evidence that relation between aggregate imports and the main components of final demand significantly integrated.

A disaggregated analysis of the relationship between imports of various commodity groups was applied by [2]. The linkages between Libyan imports of various commodity

groups were examined in their study during various periods of fluctuation in oil prices: The results of their models indicate that reduction in oil revenue during the period 1982-1998 has completely upset the import-income relationship which was developed during the boom years, 1974-1981 while the rise in oil revenue during the period 1999-2005 has recreated an improvement in the relationship.

III. THE STRUCTURE AND PERFORMANCE OF LIBYAN IMPORTS

The structure and composition of Libyan imports during the period of 1975-2008 are illustrated in Table I. As shown in Table I, the two-digit statistical standard international trade classification (SITC) is used in order to describe and classify Libyan imports into nine major groups. It can be concluded that most of Libyan expenditure on imports are related to machinery and transport equipment; manufactured goods classified by material and food and live animals.

TABLE I: LIBYAN COMPOSITION OF IMPORTS

ITEMES	1975	1986	2008
Food and live animals	19.3	16.9	14.1
Beverages and tobacco	1.2	0.5	0.2
Crude materials, inedible, except fuels	1.9	1.8	1.4
Mineral fuels, and related materials	3.3	0.7	0.7
Animal and vegetable oils & fats	1.5	1.9	1.9
Chemicals	5.7	5.4	4.0
Manufactured goods classified mainly as per material	21.9	24.1	19.9
Machinery and transport equipment	29.9	38.0	48.0
Miscellaneous manufactures	15.3	10.7	9.8
Other Material	20.5	17.4	14.3
Total Imports	100	100	100

Sources: [17], [18].

Libyan imports of machinery and transport equipment amounted to 48 percent of total imports in 2008 compared with 38 percent in 1986 and around 29 percent during year of 1975. However, the percentage of imports of manufactured goods classified by material and manufactured articles did not change much over the last four decades (amounting to approximately 19-24 percent of total imports). The percentage of Libyan imports of food and live animals was higher during oil boom periods than during the recession period. This percentage amounted to 14.1 percent in 2008 compared with 19.3 percent in 1975 and 16 percent in 1986.

The magnitude of Libyan imports with its major trading partners is given in Table II. It shows that less than 55 percent of Libyan imports in 2008 were imported from the industrial countries and over 45 percent of Libyan imports were imported from developing countries.

Data in Table II shows Libyan Imports in 2008 from the top trading partners. It suggests that the highest proportion of Libyan imports from industrialized countries in 2008 were imported from Italy (12%), Germany (5.0%), UK (2.4%), USA (2.7), France (3.8%) and china (4.3%). On the other hand, the percentage of Libyan imports from the Arab world was approximately 4.2 percent of total Libyan imports in 2008. The highest proportion of Libyan imports from Arab

countries in 2008 was imported from Tunisia, Egypt, and Morocco.

TABLE II: LIBYAN DIRECTION OF IMPORTS IN 2008 (IN MILLIONS US\$)

Country	Value	%
Italy	2480	12
Germany	1007.8	4.9
South Korea	442	2.1
UK	498	2.4
USA	561	2.7
France	780	3.8
China	890	4.3
Japan	297	1.45
Netherlands	349	1.7
Arab countries	879.4	4.29
other countries	12275.8	59.9
Total	20460.0	100

Source: [18], [19].

IV. THE GROWTH RATE OF LIBYAN IMPORTS

The aim of this section is to estimate the growth rate of Libyan imports over the period 1975-2008. As indicated earlier, Libyan economy depends heavily on its oil revenue and due to limited productive capacity. Hence, it is expected that growth rate of its imports would be affected by fluctuations in oil price because of its great dependence on oil revenue. Accordingly, the growth rate of Libyan imports was calculated during three periods that experienced essential fluctuations in oil prices since 1973. The distinguished periods are:

- 1975-1985
- 1986-1998
- 1999-2008

The first and third periods represent substantial increases in oil prices. While the second periods represent the years of relative lower levels of oil prices. The growth rate of Libyan imports was calculated using the following regression model:

$$\ln Y_{it} = b_0 + b_1 t + \mu_t \quad (1)$$

where

Y_{it} represents the natural logarithm of Libyan imports in period t (assessed in current values and measured in Libyan dinar, while t measures the time. Therefore, the coefficient b_1 is the constant growth rate of Libyan imports.

The result of the regression model is presented in Table III. It reveals that the rate of growth of Libyan imports of goods and services has changed sharply during periods of fluctuations in oil prices. The rate of growth of Libyan imports was highly positive during periods of rise in oil prices (1975 -1985 and 1999-2008) and was negative during periods of fall in oil prices (1986-1998).

TABLE III: THE GROWTH RATES OF LIBYAN IMPORTS OF GOODS AND SERVICES

Period	Percentage Rate of Growth
1975-1985	4.3
1986-1998	-.5
1999-2008	3.8

V. SPECIFICATION OF THE MODEL AND ECONOMETRIC RESULTS

Drawing upon the existing literature and following [5], [6], [16] suggestions and recommendations, the following model was considered and applied in order to estimate and evaluate the overall import function in the Libyan economy during the period 1975-2008.

$$\ln(\text{Im}_t) = b_0 + b_1 \ln(\text{Gdp}_t) + b_2 \ln(\text{Pr}_t) + b_3 \ln(\text{Inv}_t) + b_4 \ln(\text{Mang}_t) + b_5 \ln(\text{Po}_{t-1}) + b_6 \ln(\text{Im}_{t-1}) + b_7 \ln(D_t) + u_t \quad (2)$$

where

(Im_t) = Libyan imports

(Gdp_t) = Libyan gross domestic product,

(Inv_t) = investment expenditure,

(Mang_t) = Managerial expenditure

All data were at constant price deflated by GDP Deflator (2003=100)

(Pr_t) = relative prices, obtained by dividing import price index on consumer price index multiplied by 100 (2003=100)

(Po_{t-1}) = total of Libyan population estimated at period t (in Millions)

u_t = the error term

(D_t) = A dummy variable

where

$D_t = 1$: 1975-1985; 1999-2008

$D_t = 0$: 1986-1998

It is important to indicate that all variables were calculated in the natural logarithm and the type of lagged variable for one period for the dependent variable (Im_{t-1}) . The hypothetical reasons for this can be illustrated as following: Firstly, the equations include the concept of lagged dependent variable allowing for partial adjustment or spread effect. Secondly, since the constant impact of imports on the economy is not expected over time. Therefore, simple linear relationships would seem to be incorrect method of examination. Hence, it is suitable to use the natural log technique in order to deal with these difficulties [20].

The data in this section covers the period from 1975-20008, and has been collected from [17], [18], [21] in order to estimate and evaluate the import function in Libya. Eviews program package was used to carry out the results of the estimated equations as illustrated in Table IV.

The results of equation a in Table IV suggest that the coefficient b_3 which represent investment expenditure is not significant at the five per cent level of significance. Also, according to economic theory the coefficient of managerial expenditure carry a negative sign which is incorrect. Therefore, aforementioned variables have been removed from the model. As can be seen from Table IV, the model re-estimated and the regression results of equation B shows that the coefficient b_2 which represent the variable of relative prices is not significant at the five per cent level of significance. This indicates that Libyan import is not related to changes of relative price. The regression results in Table IV confirm that equations C is appropriate, as evident from

the values of adjusted $\bar{R}^2$ and the “t” statistics (shown under each coefficient). However, coefficient b5 has lower value of significance. Hence, the population factor has been excluded from the model in order to get the best and fit equation.

In view of that, the model has been re-estimated again and the econometric results of equation D suggests that all variables carry the correct signs and the equation seems to be sufficient as evident from the values of adjusted $\bar{R}^2$ and the “t” statistics (shown under each coefficient). Further, during the period 1975-2008 the Durbin h statistic does not show any significant problem of serial correlation at the five per cent level of significance. Over all, the equation is suitable as evident by the fact that the F test and the coefficients of the

lagged variables lies between zero and one in this equation [22], [23].

The estimated coefficient $\hat{b}_2$ represents the short-term elasticity, while the long-term elasticity is given by $\hat{b}_2 / [1-\hat{b}_6]$ [24]. Therefore, the short-term elasticity of Libyan imports from with respect to its income is approximately 1.2, while its long-term counterpart is approximately 3.12. The short term and long term elasticity, have a positive signal as expected, this means that when you increase the value of GDP in the current year (t) (1%) With other factors to lead to Imports rise 120% percent in the short term and by 312% in the long term.

TABLE IV: THE RESULTS OF THE ESTIMATED ECONOMETRIC MODEL

	$\hat{b}_0$	$\hat{b}_1$	$\hat{b}_2$	$\hat{b}_3$	$\hat{b}_4$	$\hat{b}_5$	$\hat{b}_6$	$\hat{b}_7$	R^2	F	“h”
A	-7.6 (-1.4)	1.4 (2.1)	-0.11 (-1.2)	0.57 (0.22)	-0.50 (-1.9)	1.2 (2.5)	.14 (2.4)	-.18 (-1.1)	0.92	54	1.8
B	-9.9 (-1.8)	1.2 (2.1)	-0.60 (-0.2)			0.66 (1.6)	0.50 (2.9)	-.20 (-1.2)	0.91	70	1.0
C	-8.3 (-1.8)	1.03 (2.3)				.68 (1.6)	.55 (3.8)	-.26 (-1.7)	0.91	89	1.8
	-10.5 (-2.4)	1.2 (2.5)					0.68 (5.2)	-0.35 (-2.5)	0.91	111	1.9

IV. CONCLUSION

The aim of this paper is to estimate and evaluate the demand import function in Libyan economy. The OLS method of estimation was used in order to estimate all equations and the results of the best estimated equation confirm that the main determinants of Libyan imports are: the Libyan GDP; Oil Prices fluctuations and Partial adjustment of Libyan imports.

Finally, it is important to suggest that in future studies, researchers should take in to consideration the structure break problems and long term relationship in estimating the import function in Libyan economy.

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