Estimating of Import Demand Function in Egypt

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Abstract

This study aims to estimate the determinants of import demand in Egypt, utilizing the ordinary least squares (OLS) approach and the vector error correction model (VECM) for the period (1982-2021). The results of the study indicate a positive and significant relationship between the demand for imports and exports, evident in both short and long-term perspectives. Additionally, a negative and significant relationship is identified between import demand and the real effective exchange rate. These findings carry implications for Egypt's balance of payments. The surge in imports, driven by the concurrent increase in exports, serves as a crucial source of foreign exchange, enabling the country to meet fundamental needs for food commodities and production requirements. However, a caveat is noted: if the growth rate of imports surpasses that of real income, it may lead to a deterioration in the trade balance. In conclusion, the paper emphasizes the necessity to foster export-led growth and underscores the importance of carefully considering alternative strategies, particularly given the limited impact of currency depreciation on import dynamics. Furthermore, the study recommends monitoring inflation trends to gain insights into potential shifts in consumer preferences towards imported goods.

Keywords: Import Demand Function, OLS, Vector Error Correction Model (VECM), Cointegration, Egypt.

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1. Introduction

Egypt, located at the crossroads between Africa and the Middle East, has a rich historical heritage and a strategic geopolitical location. Its economy, one of the largest in the region, is characterized by a diverse range of sectors, ranging from agriculture and manufacturing to tourism and services. With a population exceeding 100 million, Egypt has great potential for economic growth and development. However, like many emerging economies, it faces many challenges and opportunities in dealing with the complexities of global trade dynamics, particularly concerning import demand.

Estimating the import demand function is crucial for policymakers to gain insights into the factors influencing Egypt's import demand. This understanding helps in making informed decisions regarding trade policies, tariffs, and import quotas. Moreover, it plays a vital role in economic analysis, trade forecasting, and efficient resource allocation, contributing to strategic initiatives aimed at enhancing the country's trade position.

The theoretical and empirical literature on import demand sheds light on the complex factors shaping trade dynamics in Egypt. Theoretical frameworks, such as the imperfect substitution theory, Keynesian theory, and neoclassical theory, provide insights into how factors like income, relative prices, and macroeconomic conditions influence import demand. At the same time, empirical studies provide careful analysis of import behavior in Egypt, considering variables such as GDP, exchange rates, exports, and inflation rates. Several seminal studies have significantly contributed to our understanding of import demand in Egypt. Shehab (2012) addressed the determinants of imports in Egypt in the period from 1980 to 2010, and highlighted the impact of GDP, foreign reserves, exchange rates, exports, and inflation rates. Khalil (2013) employed the Partial Adjustment Model (PAM) to identify relative prices as the main factor shaping Egyptian imports, and to explain the short- and long-term dynamics. Rashwan & Elshamy (2014) examined the interaction between imports, relative import prices, and real GDP, revealing positive short-run correlations with GDP and negative correlations with relative prices. Adams & Metwally (2021) studied the impact of Egyptian currency depreciation on trade balance under the Egypt-IMF plan, focusing on the importance of structural changes in exports and imports beyond currency devaluation alone. Sayed (2022) analyzed Egyptian food imports, focusing on population growth and inflation rate as key factors affecting import dynamics.

Building on this foundational literature, this paper seeks to provide a comprehensive analysis of import demand in Egypt. By integrating theoretical insights with empirical

findings, we aim to provide invaluable insights into the factors driving import dynamics in Egypt and their implications for economic policy. In addition, we stress the need to adopt a comprehensive and forward-looking approach to trade policy and economic development in Egypt.

This paper, using the Ordinary Least Squares (OLS) approach and the Vector Error Correction Model (VECM) during the period (1982-2021), seeks to identify the determinants of demand for Egyptian imports. Empirical results confirm the existence of a positive and significant relationship between demand for imports and lagged values of imports and exports, in the long and short run. This highlights the essential role of exports in strengthening imports. The response of imports to GDP growth emerges as feeble in the short term, suggesting that while economic expansion may not immediately spur import growth, its impact may become more pronounced over the long term.

In light of these results, formulating policy recommendations to reduce imports and improve the trade balance is extremely important. But the essence of the matter lies in strengthening the trade balance without having to reduce imports. Given Egypt's importing nature and the scarcity of self-sufficiency in producing these goods, the primary motivation for imports must stem from the export front. Nevertheless, divergent perspectives assume that heightened import demand could deleteriously impact a nation's balance of payments. Advocates of this view advocate import substitution and fair trade, expressing concerns that unrestricted trade could hamper economic development, especially in developing countries.

This paper contributes to the literature by providing empirical insights into the specific determinants of import demand in Egypt, using a powerful methodology, and offering policy recommendations tailored to the country's unique trade patterns. This paper also addresses limitations and gaps identified in previous literature by attempting to estimate the import demand function in Egypt. Through econometric methods and a comprehensive consideration of determinants, the study aims to deepen understanding of import dynamics in Egypt, providing valuable insights for policymakers, researchers, and practitioners. Furthermore, the study enriches the broader literature on import demand by offering context-specific analysis and enhancing understanding of import behavior within the Egyptian economy. Ultimately, this paper seeks to advance knowledge in the field and facilitate evidence-based decision-making in Egypt's import policy and economic management.

2. Literature Review

This literature review embarks on a journey to explore the intricate landscape of import demand determinants across various countries and over time. By delving into theoretical frameworks and empirical evidence, this review aims to illuminate the divergent perspectives and shed light on the complex interplay of factors shaping import demand dynamics.

2.1. Theoretical Literature

The literature review explores the determinants of import demand across different countries, revealing variations over time and depending on measurement proxies. While income and relative import price are commonly cited as key determinants, their impact varies by country. There's no consensus on the import-growth nexus, with some suggesting imports hinder economic growth and balance of payments, while others argue that certain imports, like hardware and electronic equipment, can stimulate investment and contribute to economic growth. This variation sheds light on the need for a comprehensive understanding of import demand dynamics, considering the diverse measurement proxies and temporal fluctuations. **(Bakari and Mabrouki, 2017).**

Three major theories explaining import demand function are **the imperfect substitution theory, Keynesian theory, and neoclassical theory. The imperfect substitution theory** highlights the influence of price and income on import demand, viewing consumers as utility maximizers within a budget constraint. **The Keynesian theory** ties import demand to macroeconomic factors, assuming variable employment and adjustable capital movements. Meanwhile, **the neoclassical theory**, linked to the Heckscher-Ohlin framework, suggests that import demand is influenced by production costs relative to trading partners, focusing on comparative advantage and relative import prices, while assuming fixed employment and given output **(Englama et al., 2013)**. In other words, the theory suggests that import demand is also determined by the cost at which the importing country produces a particular commodity relative to its trading partner. The comparative advantage is focused on the effects of relative import price on the volume and direction of international trade. The theory is not concerned with the effects of changes in income on trade, as the employment is assumed to be fixed and output is given **(Shuaibu & Fatai, 2014).**

Moreover, the findings of several studies have confirmed that the main drivers of import demand depend on whether the income variable is used as a single variable or is disaggregated into different components. In general, the majority of the studies found that income and relative import price are the key determinants of import demand –

although the nature of the impact of these factors differs from country to country **(Nomfundo & Nicholas, 2020)**.

2.2. Empirical Literature

2.2.1. The Determinants of Import Demand in Developing Countries

The empirical literature on import demand offers a variety of studies that provide insights into the factors shaping import dynamics across different contexts. Researchers have investigated various determinants of import demand, highlighting their complexity and volatility. These studies highlight the need for careful analyzes that consider the unique economic landscape of different countries and regions. Abrishami and Mehrara (2002) conducted a study focusing on Iran, while Dutta and Ahmed (2004) analyzed import demand in India, Hussain (2007) explored Jordan, and Chen (2008) examined Taiwan. These studies investigated the determinants of import demand over different periods, using methods such as bounds test and co-integration. In these diverse countries, income has consistently emerged as an important driver of import demand, reflecting the global impact of economic prosperity. However, the impact of relative import prices and import liberalization exhibited variations, highlighting the unique nature of each country's economic landscape.

Regarding the import demand elasticity, Uzonoz and Ajay (2009) studied it in Turkey, while Agboola (2009) analyzed the Philippines, and Narayan, S. & Narayan, D. (2010) focused on Mauritius and South Africa. Collectively, these studies have looked at specific goods or sectors and investigated the import demand elasticity. They found that domestic prices, economic factors, and structural changes played crucial roles as determinants. Overall, these results highlighted the complex relationship between import demand and specific economic conditions. In comparative studies, Zhu and Dube (2011) explored CIBS countries, while Fukumoto (2012) concentrated on China and East Asian countries. Both studies investigated how economic development and the nature of goods influence import demand. They challenged conventional theories by uncovering deviations from expected relationships between import prices and demand, indicating the necessity to adapt theories to accommodate the diverse economic structures and needs of individual countries.

Addressing exchange rate uncertainties, Jiranyakul (2013) for Thailand, Yahia (2015) for Libya, Baek (2015) for Korea, and Hossain et al. (2019) in a broader set of studies examining regional perspectives and factors affected by exchange rate uncertainty. They analyze the impacts of income, relative prices, and exchange rates on import demand, with particular focus on regional economic dynamics.

Some studies have provided more details regarding the factors affecting import demand, such as Vacu, N.P., & Odhiambo, N.M. (2022) who provided a case study of Tanzania, conducting aggregate and detailed analysis of import demand. Their findings revealed diverse influences on import demand across consumer, intermediate, and capital goods, including factors such as investment, exports, and trade policy. This study highlighted the significance of customizing import demand analysis to account for specific contexts and types of goods.

In summary, the literature paints a complex and multifaceted picture of import demand, emphasizing the need for context-specific analyses and challenging traditional economic theories in light of evolving global dynamics (See table 1 in the appendix).

2.2.2. The Determinants of Import Demand in Egypt

Here are some insights into Egypt's Import Dynamics, from a comprehensive Review. Shehab (2012) investigated Egypt's import determinants from (1980-2010), finding GDP, foreign reserves, exchange rate, exports, and inflation rate to be key factors. Using the Cointegration and error correction model (ECM), results showed a long-term equilibrium relationship between imports and determinants, with GDP as the most significant determinant. Khalil (2013) used the Partial Adjustment Model (PAM) from 1991-2010, identifying relative prices as the primary factor affecting Egyptian imports in both short and long terms, followed by the exchange rate. The results also indicated that the import balance in the partial adjustment model tends to be stable in the long run.

Rashwan & Elshamy (2014) explored the relationship among imports, relative import prices, and real GDP, noting that changes in foreign reserves and relative prices impacted imports. The Error Correction Model was used to investigate the dynamic behavior of import demand. In the short run, there was a positive relationship between imports and GDP, and a negative relationship between imports and relative price. Ibrahim, M. (2017), empirically estimated the crucial parameters influencing merchandise import demand in Egypt using the Ordinary Least Squares (OLS) approach and Error Correction model over the period 1970-2014. The empirical findings revealed a positive and significant relationship between merchandise import demand and real gross domestic product in both the long run and short run, while indicating a negative and significant relationship between merchandise import demand and the real effective exchange rate.

Adams & Metwally (2021) studied the impact of Egyptian currency depreciation on trade balance under the Egypt-IMF plan, concluding that while the deficit would shrink, sustained surplus required structural changes in exports and imports, not solely currency devaluation. The study was conducted by testing the validity of the Marshall Lerner (ML) condition, which states that if the elasticity of both exports and imports are greater

than one then in this case a depreciation of the exchange rate would lead eventually to the improvement of the trade balance. A pair of limitations were found, the first is the annual data frequency, rather than monthly or even quarterly, which means that the sample size would have been larger, and the estimated parameters could have been more accurate in forecasting the future behavior of exports and imports. The second limitation is the absence of additional factors like consumer spending. Sayed (2022) analyzed Egyptian food imports from (1990-2019), highlighting population growth and inflation rate as crucial factors. Using the Vector Error Correction Model (VECM), the study revealed a weak response of food imports to per capita GDP changes, indicating a more significant substitution effect than income effect and the inelasticity of import prices in the short term, making it challenging to reduce food imports and trade balance deficit through monetary policy.

Collectively, these studies offer a multifaceted view of Egypt's import dynamics, emphasizing the intricate role of variables like GDP, exchange rates, and relative prices. Challenges, such as data frequency limitations, call for more comprehensive models and frequent data updates to provide detailed policy insights. Importantly, the findings stress the need for a holistic, long-term approach in managing Egypt's trade balance (See table 2 in the appendix).

3. Stylized Facts About the Behavior of Import Demand in Egypt

Studying the behavior of import demand in Egypt is vital for gaining insights into the country's economic dynamics, trade policies, and balance of payments management. The findings from empirical studies contribute to informed decision-making by policymakers to ensure sustainable economic development.

Imports play a crucial role in the economic growth and development of Egypt. As a developing country, Egypt relies on imports to acquire goods and services that may not be efficiently produced domestically. Collectively, these studies offer a multifaceted view of Egypt's import dynamics, emphasizing the intricate role of variables like GDP, exchange rates, and relative prices. Challenges, such as data frequency limitations, call for more comprehensive models and frequent data updates to provide detailed policy insights. Importantly, the findings stress the need for a holistic, long-term approach in managing Egypt's trade balance (See table 2 in the appendix).

As shown in figure 1, total exports of goods and services have declined from 19.9% of GDP to 13.1% of GDP during the period 1990-2020. While total Imports of goods and services have declined by only 1.1% during the same period (World Bank, World Bank Development Indicator, http://data.worldbank.org/indicator/).

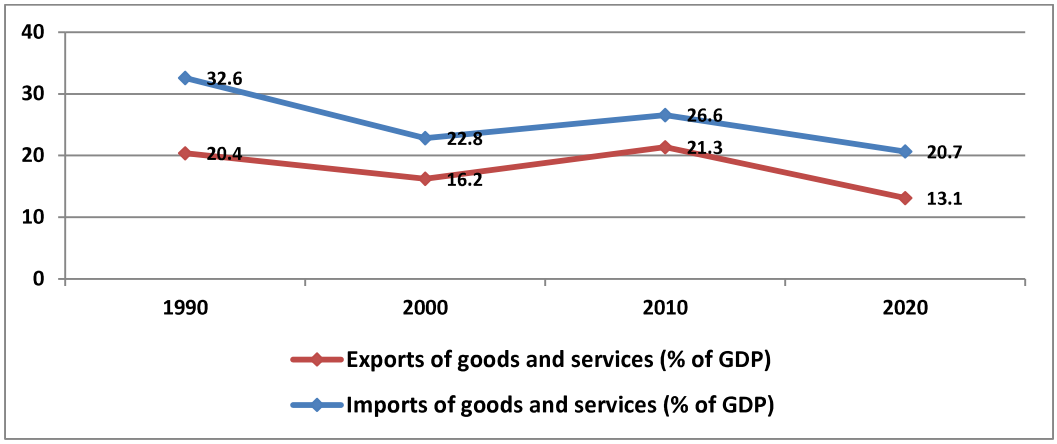

Figure1: Exports and Imports of Goods and Services (% of GDP) * (1990-2020)

Source: World Bank, World Development Indicators, Dataset,
*** calculated by the author.**

As can be seen from Figure 2, the proportion of merchandise imports to total Egyptian imports increased from 67.5% in 2000 to 72% in 2020. While the proportion of service imports to total Egyptian imports decreased from 32.5% in 2000 to 28% in 2020.
At the same time, the data indicates that total Egyptian imports of goods and services took an upward trend over the period 1990-2020, with two peak points after 2008 and 2016, i.e. after the global financial crisis of 2008, as well as after the exchange rate float in 2016 (figures 3 & 4).

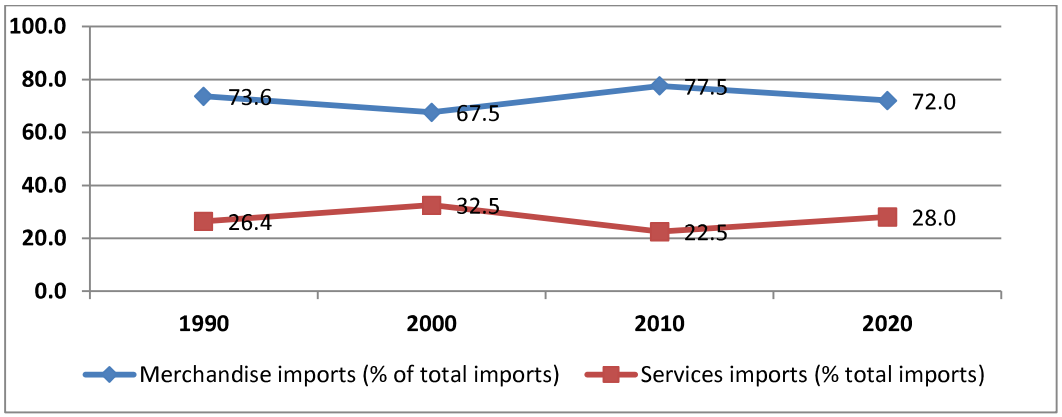

Figure 2: Merchandise VS. Services Imports (1990-2020)

Source: World Bank, World Development Indicators, Dataset

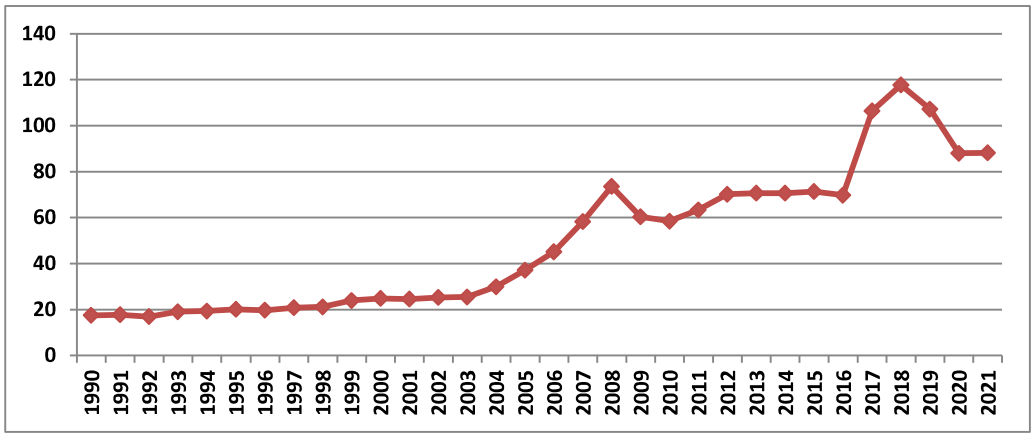

Figure 3: Imports of goods and services 1990-2021 (constant 2015 billion US$)

Source: World Bank, World Development Indicators, Dataset

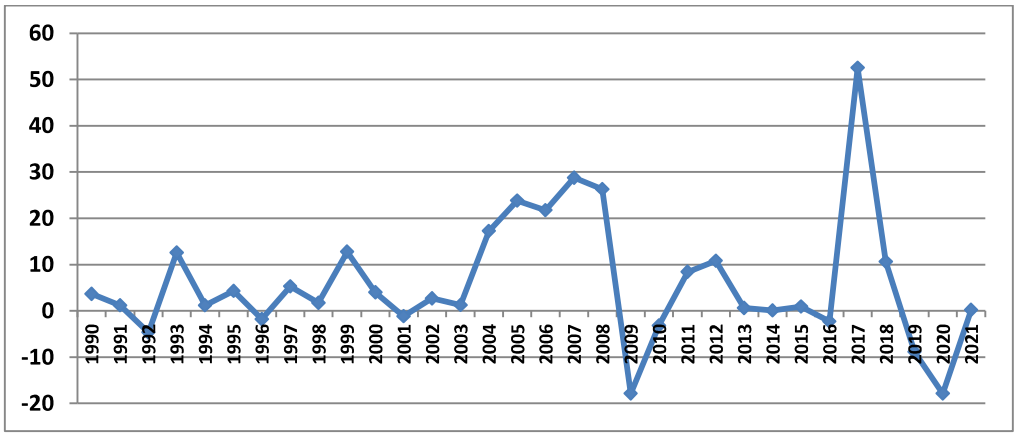

Figure 4: Growth Rates of Imports of goods and services 1990-2021 (%)

Source: World Bank, World Development Indicators, Dataset

When analyzing the performance of Egyptian import (merchandise and services), the import structure must be analyzed. Figure (5) illustrates the changes that occurred in the structure of **merchandise imports** during the period 1995-2021. It can be noted that imports of manufactures, food and fuel achieved the highest average annual growth rate during the period 1995-2021.

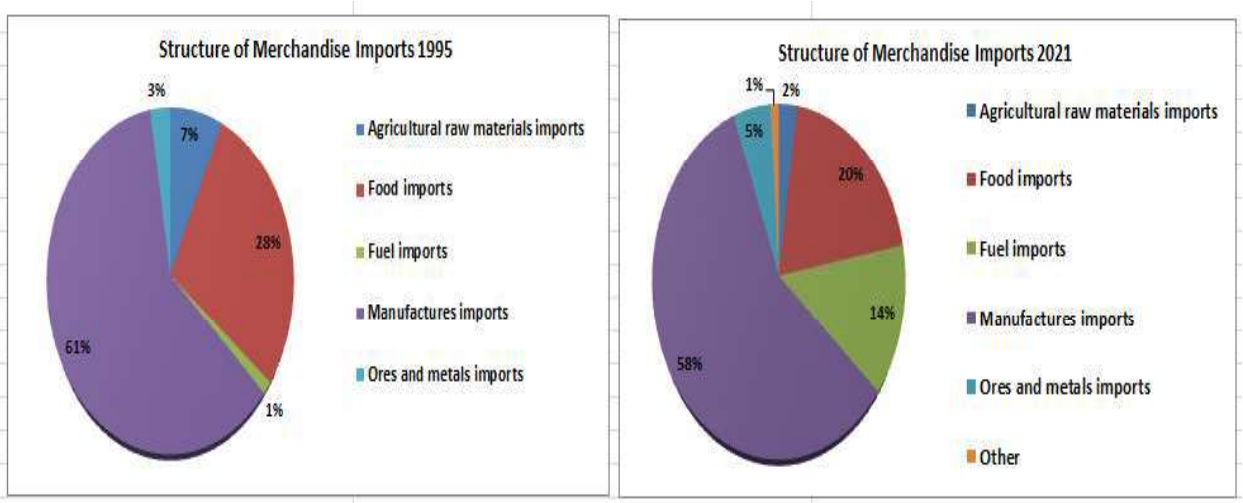

Figure 5: Structure of Merchandise Imports 1995 & 2021

Source: Drawn by author from Central Bank of Egypt, Monthly Economic Bulletins, various years.

Regarding the structure of Egyptian **commercial services imports**, Egypt's imports of transportation services increased from 35% in 1995 to 49% in 2021, while Egypt's imports of computer and communications services as well as insurance and financial services decreased during the same period, as shown in Figure 6.

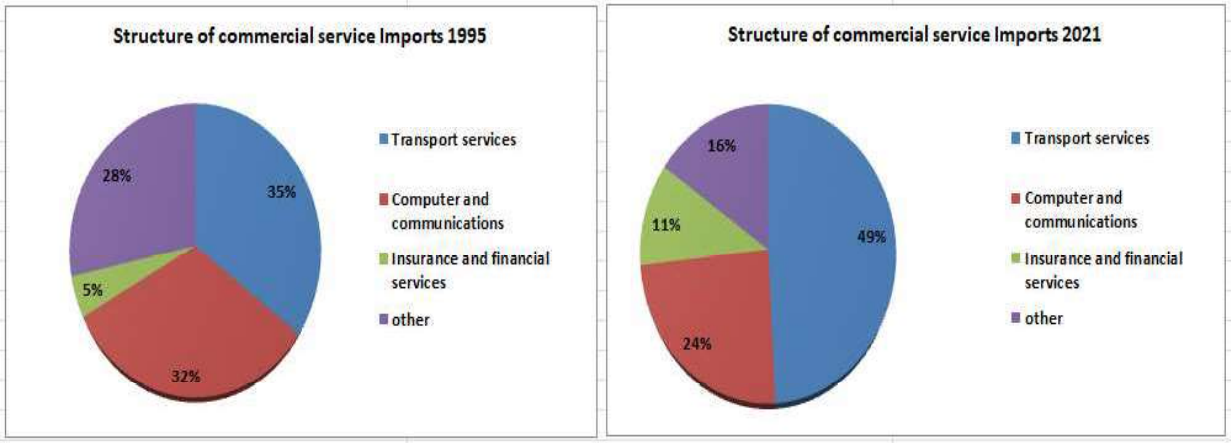

Figure 6: Structure of commercial service Imports 1995 & 2021

Source: Drawn by author from Central Bank of Egypt, Monthly Economic Bulletins, various years.

Therefore, empirical analysis seeks to validate and extend the stylized facts by investigating the relationships between total imports and key influencing factors. Through precise statistical methods, the study aims to provide valuable insights into the long-run equilibrium and short-run dynamics of Egypt's import demand, connecting theoretical considerations with empirical evidence, as follows.

4. Specification of the Imports Function and Identification of Main Determinants

Former theoretical and empirical work suggests that import demand is influenced by a number of important factors. In the following, we try to test the relationship between the total import demand and the possible factors influencing it, which we will proceed to evaluate in the following empirical work (Ibrahim, M., 2017).
Since this research uses time series data, time series analysis using a Vector Auto-regression model (VAR) requires a unit root test to ensure that all time series of the variables under study are stationary, in addition to the cointegration test between time series to show whether the study variables have an equilibrium relationship in the long run.

Research on the analysis of Egyptian imports is directed to study the factors that influence variation in Egyptian imports. This part applies time series data for the period (1982- 2021).

The import demand is generally affected as follows:

$$I = f\,(Y, REER, X, INF, RES)\ (1)^{1}$$

Where: I = aggregate imports,
Y= Gross Domestic Product
REER = Real Effective Exchange Rate
X = exports
INF = Inflation Rate
RES= International Reserves
As stated in the empirical literature section, it is found that OLS is one of the most commonly used methods and, thus, it is estimated to explain the demand for total imports in Egypt by using data from 1982 to 2021. Accordingly, for long run:

$$\log (I) = C + C_1 \log (Y) + C_2 \log (REER) + C_3 \log (X) + C_4 \log (INF) + C_5 \log (RES) + e \qquad (2)$$

It is anticipated that real GDP will positively influence imports, as an increase in real GDP typically stimulates private consumption of imported goods. Regarding the

[1] Adding exports as an independent variable extends earlier research that emphasized the influence of exports on forming import demand, as previously outlined. (Shehab, 2012; Adams & Metwally, 2021).

inflation rate, it is expected that there will be a positive impact on imports, as higher domestic inflation may prompt individuals to shift towards cheaper imported alternatives. Foreign reserves are also expected to exert a positive impact on imports, as these reserves can be utilized for the procurement of goods and services.

Data for this paper were sourced from the World Development Indicators (WDI, 2021). All variables underwent a natural logarithm transformation to mitigate heteroscedasticity issues and facilitate the calculation of elasticities. In the presence of cointegration among variables, they can be equivalently represented within a short-run Ordinary Least Squares (OLS) framework. The Engle-Granger two-step estimation technique (EG) is a commonly employed procedure for testing cointegration.

Initially, the method establishes the long-run relationship through OLS and utilizes the resulting residuals to test the cointegration hypothesis using the Augmented Dickey-Fuller test. When the cointegration hypothesis is confirmed, a Vector Error Correction Model (VECM) will be constructed to capture short-run dynamics (Phillips and Perron, 1988; Ibrahim, M., 2017).

$$\Delta log\,(I) = C + C_1\,\Delta\,log\,(Y) + C_2\,\Delta\,log\,(REER) + C_3\,\Delta\,log\,(X) + C_4\,\Delta\,log\,(INF) + C_5\,\Delta\,log\,(RES) + C_6\,ECT_{t-1} + e \qquad (3)$$

Where ECT_{t-1} is one lag error correction term and Δ is the difference operator, and this term is determined by minimizing the Schwartz information criterion or minimizing the Akaike information criterion (Rashwan & Elshamy, 2014).

Another procedure to test for cointegration is developed by *Johansen and Julesius (1992*), and it is known as the maximum likelihood (ML) approach. This method estimates and tests for multiple cointegrating vectors (multivariate cointegration). It applies the analysis of the vector auto-regressive (VAR) model where all variables are treated as endogenous.

The sign and significance of the coefficient of error correction term ECT_{t-1} describes the existence of a short run relationship. Its value and sign tell about the speed and convergence or divergence to or from the long run equilibrium.
Its negative value indicates the convergence whereas its positive value indicates the divergence. A significant coefficient of error correction with negative sign is considered as a further proof of the existence of stable long run relationship.

4.1. Stationary Check

The unit root (stationarity) analysis was firstly used to test the stationarity of the time series and determine the order of integration of the series. For that reason, the Augmented Dickey Fuller (ADF) test (1981) was implemented to determine whether the series has a unit root or not. The ADF test determines whether the data series are drifting and discovers whether the data series need to be differentiated and how many times this must be done in order to induce their stationary condition.

The Augmented Dickey Fuller (ADF) test is calculated for individual series to provide evidence as to whether the variables are stationary and integrated of the same order. The results for each variable appear in Table 1. As shown in Table 1, the null hypothesis of a unit root can't be rejected for levels of all variables (except for inflation) but the null hypothesis is rejected for the first differences of all other variables. Therefore, we conclude that the series are integrated of order one.

Table 1: Model Variables and Stationarity

Variable		Unit Root Test Result
I	Imports of goods and services	Has a unit root in the level, and stationary in the first difference with intercept.
Y	Gross Domestic Product	
REER	Real Effective Exchange Rate	
X	Exports of goods and services	
INF	Inflation Rate	
RES	International Reserves	

Table 2: Augmented Dickey Fuller (ADF) test for Stationarity

	Level		1st difference	
	t-statistic	**p-value**	**t-statistic**	**p-value**
LI	-0.310	0.914	-4.645*	0.001
LY	-1.241	0.645	-4.213*	0.002
LREER	-3.396	0.067	-5.077	0.001
LX	-0.794	0.810	-4.635*	0.001
INF	-2.890	0.056	-8.380*	0.000
LRES	-2.202	0.209	-3.309*	0.021

Notes: ADF (1981) unit root test with the Ho: Variables are I (1);
*** indicates significance at the 1% level.**
Source: compiled by the author from unit root test using EViews 12.

By analyzing the results, we note that:

- The data series of all variables in the model for level form are nonstationary when a significant level = 1%, 5% and 10% because the absolute value of the test statistic is less than the absolute critical value whether the model is constant or with constant and trend.
- The data series of all variables for the first differences are stationary at all significant levels (1%, 5% and 10%) because the absolute value of the test statistic is more than the absolute critical value (model with constant or with constant and trend).
- Each variable of these variables in the first difference model is Integrated of order one I (1).

Analysis of information in Table 2 shows that all variables are stationary in the first difference. In this case, the level of integration is 1 for a threshold of 1% because **all the variables are stationary in the first difference**, that is, I (1). The stationarity test is verified, and then we move on to the cointegration test. Since the variables have the same level of integration I (1), we use the two-step method developed by Engel and Granger (1987) to perform the cointegration relationship.

4.2. Johansen Cointegration Test

The basic idea behind cointegration is that if all the components of a vector time series process I_t have a unit root, or in other words, it is a multivariate I (1) process, it is said to be cointegrated when a linear combination of them is stationary, that is if the regression produces an I (0) error term.

Cointegration analysis refers to the process of getting equilibrium or long-run relationships among non-stationary variables. The idea is that although the variables are non-stationary, a linear combination of them may be stationary, given that all variables are integrated of the same order (Engle and Granger, 1987). The vector that links the variables in the long-run relationship is called the cointegrating vector.

The next table gives the results of a cointegration test based on the Trace of the stochastic matrix and the Maximum Eigenvalue. This test confirms the existence of cointegrating between the variables, i.e. the existence of a long-run relationship among total imports, GDP, total exports, total reserves, and real effective exchange rate. Trace test indicates 2 cointegrating equations at the 0.05 level, but Max-eigenvalue test indicates no cointegration at the 0.05 level.

Table 3: Results of Cointegration Test

Rank	Trace Test		Max Eigenvalue	
	Test stat	p-value	Test stat	p-value
0*	80.333	0.006*	29.606	0.149
1*	50.726	0.026*	21.748	0.233
2	28.978	0.062	20.204	0.067
3	8.774	0.387	8.757	0.307
4	0.017	0.897	0.017	0.897

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
Max-eigenvalue test indicates no cointegration at the 0.05 level
*** denotes rejection of the hypothesis at the 0.05 level**
Source: compiled by the author using E-Views12.

After checking the Johansen test, the functions were estimated using both OLS and the method of Two Stages Least Square (2STLS), and a list of instruments were used in the four specifications.

4.3. Empirical Results

The estimated OLS model is calculated using EViews, as it is shown in Table 3–A & 3-B in the appendix.

$$\log (I) = -0.32 + 0.73 \log(L\_1) + 0.06 \log (GDP) + 0.02 \log (REER) + 0.7 \log(X) - 0.49 \log (X\_1) - 0.02 \log(RES) + e \quad (4)$$

$$Dlog (I) = -0.015 + 0.11 Dlog(L\_1) + 0.7 Dlog (Y) - 0.01 Dlog (REER) + 0.65 Dlog(X) - 0.17 D log (X\_1) - 0.05 Dlog(RES) + e \quad (5)$$

The first regression equation (4) indicates that, in the long run, imports are affected by the logarithm of lagged imports, GDP, the real effective exchange rate, exports, lagged exports, and international reserves. The coefficients provide information about the percentage change in imports associated with a 1% change in each individual variable. The results show the importance of exports in the current year and their lagged values. The results indicate that imports are strongly affected by Egyptian exports. This means that an increase in exports by 1% leads to an increase in imports by 0.7%. This means that imports must continue for a period of time, especially production inputs, in order for exports to be encouraged.

However, the previous year's exports negatively affect the current year's imports, meaning that an increase in exports in a previous year by 1% leads to a decrease in the

volume of imports by a smaller percentage. The results in Table (3-A) indicates that there is an insignificant relationship between import and GDP, REER and RES.

While the regression equation (5) indicates that changes in imports are affected in the short run by export growth rates. A 1% increase in the export growth rate is associated with a 0.65% increase in the import growth rate in the short run. The inclusion of an error correction term allows analysis of short-run dynamics and how the system adapts from short-run deviations to long-run equilibrium, providing a more comprehensive understanding of the relationships between variables (Sayed, H., 2022).

To evaluate the adequacy of the model specification, various tests were conducted. **First, the Breusch-Godfrey Serial Correlation LM Test** was employed to examine serial correlation. The p-values, derived from the chi-squared test, usually result in rejection of the null hypothesis for p-values < 0.05. However, as indicated in table 4 (in the appendix), the p-values indicate a non-rejection of the null hypothesis. This implies an absence of serial correlation in the errors.
Another test was conducted to check that **the model has no omitted variables**, the null hypothesis in **Ramsey's RESET test** is that the model has no omitted variables. P-value is 0.17. Hence, we cannot reject H0, meaning that there are no omitted variables in the specification of the model (See table 5 in the appendix).

Given the observed cointegration relationship among the variables, a Vector Error Correction Model (VECM) is used to examine the short-run dynamics. This model accommodates both the long-run relationship, by incorporating variables with lagged values, and the short-run relationship by including time series differences. Since these **variables (except inflation) exhibit cointegration**, they can be expressed equivalently in the form of short-run ordinary least squares (OLS) regression. The next step involves creating a **Vector Error Correction Model** (VECM) to illustrate the short-run dynamics (table 4).

Table 4: VECM Results

Variable	Coefficient	Standard errors	t-ratio
EC (t-1)	-0.312	(0.180)	[-1.794]
D(LI_1(-1))	0.816	(0.362)	[2.253]
D(LY(-1))	0.650	(1.483)	[0.439]
D(LX(-1))	-0.581	(0.269)	[-2.163]
D(LREER(-1))	-0.060	(0.140)	[-0.432]
D(LRES(-1))	0.007	(0.101)	[0.068]
R-squared	0.837		

Source: Compiled by the author using E-Views12.

The error correction coefficient (table 4) represents the speed of adjustment in the long run. In this case, the negative coefficient suggests that there is a mechanism to correct deviations from the long-term equilibrium, and the magnitude indicates the strength of this adjustment. The t-ratio is a measure of the statistical significance of the coefficient, and a value of -1.794 indicates that the coefficient is statistically different from zero (at a significance level of 5%). Therefore, the error correction is correctly negatively signed and significant (-0.31), suggesting a speed adjustment process, which means that, if import demand is 1% out of equilibrium, a 31% percent adjustment towards equilibrium will take place within the first year. D(LI_1(-1)) coefficient represents the short-term impact of the lagged first difference of the variable LI (an independent variable) on imports. The positive coefficient suggests a positive relationship, and the t-ratio of 2.253 indicates that the variable is statistically significant at 5% level. While D(LX(-1)) coefficient represents the short-term impact of the lagged first difference of the variable LX on imports; this negative coefficient suggests a negative relationship, and the t-ratio of -2.163 indicates that the variable is statistically significant at 5% level. Overall, the R-squared value of 0.837 indicates that the model explains a significant portion of the variance in the dependent variable (imports). The significance of each coefficient is assessed based on the t-ratio, where values significantly different from zero indicate statistical significance.

Table 5: Variance Decomposition of Egypt's Imports Quantity

Variance Decomposition of LI:						
Period	**S.E.**	**LI**	**LY**	**LX**	**LREER**	**LRES**
1	0.115970	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.185427	96.60553	0.017444	2.081162	0.873299	0.422570
3	0.229284	94.89813	0.011560	2.093735	0.961051	2.035525
4	0.260419	92.52731	0.011491	1.659384	0.868632	4.933185
5	0.287099	89.45361	0.017956	2.059615	0.791505	7.677310
6	0.310663	86.93554	0.016459	2.842087	0.702192	9.503724
7	0.331540	85.13298	0.017480	3.598202	0.621112	10.63023
8	0.350719	83.81985	0.023156	4.167121	0.639419	11.35045
9	0.368957	82.99504	0.023959	4.454316	0.735482	11.79120
10	0.386608	82.67207	0.021825	4.468833	0.817354	12.01992

Source: Calculated by the author using E-Views12.

The Variance Decomposition of Egypt's Imports (table 5) provides insights into the relative contributions of different shocks to the variability of the variable (LI) over time. In year 1, all of the variability in LI (Egypt's Imports Quantity) is attributed to itself (LI) in the first period, as indicated by a 100% share. There are no contributions from the other variables (LY, LX, LREER, LRES) or external factors. But over subsequent periods, the share of variance in LI attributed to itself gradually decreases, and other variables start to contribute to the variance in LI, with LY, LX, LREER, and LRES playing roles. For example, in the 2nd period, 96.61% of the variability in LI is still attributed to itself, but small contributions are seen from LY (0.017%), LX (2.081%), LREER (0.873%), and LRES (0.422%). We can see that the importance of both exports (LX) and reserves (LRES) increases over the years compared to other independent variables in contributing to explaining the variance of the dependent variable (LI).

After that, we will apply **The Impulse Response Function (IRF)**, and table 6 illustrates the response of import to any shock in a variable model and the direction of relationship for ten years.

Table 6: The Impulse Response Function

Response of LI:					
Period	**LI**	**LY**	**LX**	**LREER**	**LRES**
1	0.115970	0.000000	0.000000	0.000000	0.000000
2	0.140595	-0.002449	-0.026750	-0.017328	-0.012054
3	0.129123	-0.000282	-0.019625	-0.014317	-0.030411
4	0.113409	-0.001310	0.004967	-0.009157	-0.047702
5	0.104798	-0.002647	0.023923	-0.007957	-0.054612
6	0.100846	-0.001042	0.032331	-0.005029	-0.053330
7	0.098356	0.001824	0.034816	0.002241	-0.050124
8	0.097594	0.003044	0.034214	0.010188	-0.047717
9	0.099394	0.002033	0.030625	0.014653	-0.045714
10	0.102889	7.14E-05	0.024814	0.014848	-0.043754

Source: Calculated by the author using E-Views12

The impulse response function (IRF) provides insights into the dynamic effects of shocks to the variables in the (VECM) over time. In our output, the IRF is presented for the variable "LI" and the other variables (LY, LX, LREER, LRES) over ten periods. In period 1: The shock to "LI" itself is 0.116, and there are no effects on the other variables in this period.

In conclusion, the empirical results of the VECM model and variance decomposition revealed that the most important factors affecting Egypt's imports are exports and international reserves in the long run. Furthermore, the response of imports to GDP changes and REER is weak in the long and short run, which means that the substitution effect is more significant than income effect on Egypt's imports. On the other hand, the inflation rate has no effect. Therefore, it is difficult to rely on monetary policy to reduce imports and reduce the deficit in the trade balance.

Conclusion

This paper provides valuable insights into the determinants of import demand in Egypt, spanning from 1982 to 2021. The analysis used an Ordinary Least Squares (OLS) approach, VECM and related tests, to understand the complex dynamics shaping Egypt's import behavior. The study proposed an import demand function, incorporating variables such as Gross Domestic Product (GDP), Real Effective Exchange Rate (REER), Exports (X), Inflation Rate (INF), and International Reserves (RES). The estimation of the long-run relationship indicated a positive and significant impact of exports on import demand, emphasizing the crucial role of exports in driving import demand. The study emphasizes the importance of promoting export-led growth to stimulate imports. Hence, policymakers should focus on strategies that enhance the competitiveness of Egyptian exports in the global market.

Despite the weak impact of the exchange rate on imports, the study indicates that currency devaluation policies may have limited effectiveness due to Egypt's dependence on importing basic goods. Policymakers must carefully consider alternative approaches to achieving trade balance.

While inflation rates may not be immediate determinants of import demand, the study points to a potential long-term impact on consumer preferences. Policymakers should monitor inflation trends to anticipate shifts in consumer behavior towards imported goods. Estimation results can also be improved through the use of quarterly frequency data, which requires work on providing it for use in future studies.

To further stimulate imports, policymakers are encouraged to prioritize initiatives aimed at enhancing the competitiveness of Egyptian exports on the global stage. This entails

focusing on strategies that improve the quality and market appeal of domestic products, thereby fostering sustainable economic growth and increasing demand for imports. Moreover, policymakers should carefully consider alternative approaches to achieving a balanced trade, particularly in light of the limited effectiveness of currency devaluation policies due to Egypt's reliance on importing basic goods. Vigilant monitoring of inflation trends is essential as it enables policymakers to anticipate potential shifts in consumer preferences towards imported goods. This heightened awareness can guide the formulation of policies that align with trade and economic development dynamics. Additionally, maintaining a keen awareness of global economic developments is crucial for policymakers to adapt to the rapidly evolving international trade landscape, enabling them to make timely decisions that accommodate changing dynamics. Furthermore, to enhance the accuracy of future estimates, it is recommended to incorporate quarterly frequency data. This requires concerted efforts to improve data availability and accessibility, enabling more sophisticated and precise analysis of import dynamics.

In summary, this study not only offers insightful observations on Egypt's import demand but also presents actionable policy recommendations. Future research endeavors could delve deeper into specific sectors driving import growth and explore targeted policy measures to bolster the trade balance while safeguarding essential imports. Policymakers are urged to adopt a comprehensive and forward-looking strategy to navigate challenges and capitalize on opportunities within the dynamic global trade environment.

In conclusion, this study provides valuable insights into the behavior of import demand in Egypt. Future research could delve deeper into the specific sectors driving import growth and explore targeted policy measures to enhance trade balance without compromising essential imports. In addition, continuous monitoring of global economic trends and their impact on trade dynamics in Egypt will be crucial for making informed policy decisions in the evolving landscape of international trade.

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Appendix

Table 1: Summary of the Reviewed Empirical Literature on the Determinants of Import Demand in Developing Countries

Author(s)	Title	Country	Tested Variables	Methodology	Major determinants
Abrishami and Mehrara (2002)	Demand for Disaggregate Imports	Iran	Parallel market exchange rate	Bounds Testing Approach	Parallel market exchange rate
Dutta and Ahmed (2004)	An Aggregate Import Demand Function for India	India	Relative import price, import liberalization and Income	Johansen co-integration approach	Income
Hussain (2007)	Estimating long-run elasticities of Jordanian import demand function	Jordan	Income and relative import Price	Engle - Granger test of co-integration	Income and relative import price
Chen (2008)	Long-run aggregate import demand function in Taiwan: an ARDL bounds testing approach	Taiwan	Income and relative import price	Bounds Testing Approach	Income and relative import price (in the short run)
Uzunoz and Akcay (2009)	Factors Affecting the Import Demand of Wheat in Turkey	Turkey	Income per capita, domestic prices, exchange rate, production value of wheat, domestic demand and trend factor	Double logarithmic-linear model	Domestic wheat prices
Agbola (2009)	Aggregate Imports and Expenditure Components in the Philippines: An Econometric Analysis	Philippines	Private consumption, investment, government expenditure, export of goods and services, import price	Johansen's co-integration approach	Expenditure components and relative import price (in the long run).

Author(s)	Title	Country	Tested Variables	Methodology	Major determinants
Narayan and Narayan (2010)	Estimating Import and Export Demand Elasticities for Mauritius and South Africa	Mauritius and South Africa	Domestic income and relative import price	Bounds Testing Approach	Domestic income and relative import price
Dube (2011)	Import Demand Functions: Evidence from CIBS	CIBS countries (Brazil, China, India and South Africa)	Income, income less exports, dummy variable for structural changes, disaggregated expenditure components	Bounds Testing Approach	Income, relative import price
Fukumoto (2012)	Estimation of China's Disaggregate Import Demand Functions	China	Capital goods, intermediate inputs, and final consumption goods	Bounds Testing Approach	Income, aggregate investment, exports
Jiranyakul (2013)	Exchange Rate Uncertainty and Import Demand	Thailand	Real income and real exchange uncertainty	Bounds Testing Approach	Income and real exchange rate uncertainty
Yahia (2015)	An Econometric Estimation and Evaluation of The Import Function in The Libyan Economy	Libya	GDP, relative import prices, investment spending, managerial spending, population size, and fluctuations in oil prices	ARDL-Bounds Approach	GDP, oil price fluctuations and partial adjustment of imports
Baek (2015)	Empirical Evidence on Korea's Import Demand Behavior Revisited	Korea	Income, and relative import price	Bounds Testing Approach	Income and relative import price

Author(s)	Title	Country	Tested Variables	Methodology	Major determinants
Hossain et al. (2019)	Revisiting the import demand function: a comparative analysis. Dynamic econometric models	three panels of eight frontier countries, eight emerging countries, and ten developed countries	GDP, relative prices, and exchange rate	Panel Cointegra-tion Tests	GDP, relative prices, and exchange rate, (both in long run and short run)
Vacu, N.P., & Odhiambo, N.M. (2022)	Examining the determinants of import demand in Tanzania: An ARDL approach	Tanzania	Exchange rate, investment spending, exports, relative import price, consumer spending, government spending, Trade liberalization and imports of capital goods	ARDL Approach	exports and trade policy are the main drivers of import demand

Table 2: Summary of the Reviewed Empirical Literature on the Determinants of Import Demand in Egypt

Author(s)	Title	Country	Tested Variables	Methodology	Major determinants
Shehab (2012)	Determinants of demand for total imports of the Arab Republic of Egypt during the period 1980 - 2010: using cointegration analysis and error correction model	Egypt	Income, net foreign reserves, import relative price (exchange rate), exports, inflation (CPI)	Engle - Granger test of co-integration	Income, net foreign reserves, exports

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Author(s)	Title	Country	Tested Variables	Methodology	Major determinants
Khalil (2013)	Estimating the determinants of demand for Egyptian imports	Egypt	Income, net foreign reserves, import relative price, real exchange rate	partial adjustment model (PAM)	Import relative price, exchange rate
Rashwan & Elshamy (2014)	An Aggregate Import Demand Function for Egypt: A Cointegration Approach	Egypt	Real GDP, import relative prices, total reserves from foreign fund	Cointegration and error correction modeling approaches	Real GDP, total reserve fund, relative prices
(Ibrahim, M., 2017).	An Examination of the Merchandise Imports Demand Function for Egypt	Egypt	merchandise imports, Real GDP, inflation rate, REER, real international reserves	OLS and ECM	Real GDP, inflation rate, REER on the long run
Adams & Metwally 2021)	Testing for The Marshall–Lerner Condition in Egypt: An Empirical Analysis	Egypt	Real effective exchange rate, real GDP	Engle–Granger and Johansen co-integration	Real effective exchange rate, real GDP
Sayed (2022)	Determinants of Egypt's Food Imports Based on Vector Error-Correction Model (VECM)	Egypt	Food imports quantity, food price import, agricultural production, GDPpc, inflation rate, exchange rate, foreign reserves	Vector Error Correction Model (VECM)	GDPpc, inflation rate

Table 3- A: Ordinary Least Squares Regression Results (Long Run Relationship) *

Dependent Variable: LI
Method: Least Squares
Date: 04/14/23 Time: 15:24
Sample (adjusted): 1983 2021
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LI_1	0.733640	0.156975	4.673625	0.0001
LY	0.064293	0.109151	0.589028	0.5600
LX	0.702150	0.101495	6.918059	0.0000
LX_1	-0.488821	0.129565	-3.772793	0.0007
LREER	0.024895	0.065515	0.379994	0.7065
LRES	-0.022924	0.030070	-0.762357	0.4514
C	-0.316748	1.407400	-0.225059	0.8234

R-squared	0.991218	Mean dependent var	26.52858
Adjusted R-squared	0.989572	S.D. dependent var	0.677054
S.E. of regression	0.069140	Akaike info criterion	-2.344210
Sum squared resid	0.152972	Schwarz criterion	-2.045622
Log likelihood	52.71210	Hannan-Quinn criter.	-2.237079
F-statistic	601.9849	Durbin-Watson stat	1.487585
Prob(F-statistic)	0.000000		

Table 3-B: Ordinary Least Squares Regression Results (Short Run Relationship) *

Dependent Variable: DLI
Method: Least Squares
Date: 04/14/23 Time: 16:27
Sample (adjusted): 1984 2021
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLI_1	0.110782	0.190040	0.582940	0.5642
DLY	0.711394	0.845568	0.841321	0.4066
DLX	0.652749	0.093766	6.961434	0.0000
DLX_1	-0.165667	0.149854	-1.105522	0.2774
DLRES	-0.049485	0.056892	-0.869809	0.3911
DLREER	-0.010306	0.085624	-0.120362	0.9050
C	-0.015238	0.037626	-0.404976	0.6883

R-squared	0.706104	Mean dependent var	0.045441
Adjusted R-squared	0.649221	S.D. dependent var	0.118798
S.E. of regression	0.070360	Akaike info criterion	-2.305562
Sum squared resid	0.153466	Schwarz criterion	-2.003901
Log likelihood	50.80568	Hannan-Quinn criter.	-2.198233
F-statistic	12.41327	Durbin-Watson stat	1.910263
Prob(F-statistic)	0.000000		

Source: Calculated by the author using E-Views12

Table 4: Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	2.298743	Prob. F(2,30)	0.1178
Obs*R-squared	5.182514	Prob. Chi-Square(2)	0.0749

Source: Calculated by the author using E-Views12

Table 5: Ramsey's RESET test

Ramsey RESET Test
Equation: EQ02
Omitted Variables: Squares of fitted values
Specification: LI LI_1 LY LX LX_1 LREER LRES C

	Value	df	Probability
t-statistic	1.381247	31	0.1771
F-statistic	1.907842	(1, 31)	0.1771
Likelihood ratio	2.329228	1	0.1270

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.008869	1	0.008869
Restricted SSR	0.152972	32	0.004780
Unrestricted SSR	0.144103	31	0.004648

LR test summary:

	Value
Restricted LogL	52.71210
Unrestricted LogL	53.87671

Source: Calculated by the author using E-Views12