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### **Are Exports the Engine of Economic Growth? An Application of Cointegration and Causality Analysis for Egypt, 1977-2003**

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# **Are Exports the Engine of Economic Growth? An Application of Cointegration and Causality Analysis for Egypt, 1977-2003**

**Fouad Abou-Stait\***

## **Abstract**

The paper examines the export-led growth (ELG) paradigm for Egypt, using historical data from 1977 to 2003. During this period, Egypt changed its economic philosophy from central planning and government intervention to one based on a free market economy. The paper employs a variety of analytical tools, including cointegration analysis, Granger causality tests, and unit root tests, coupled with vector auto regression (VAR) and impulse response function (IRF) analyses. The paper sets three hypotheses for testing the ELG paradigm for Egypt, (i) whether GDP, exports and imports are cointegrated, (ii) whether exports Granger cause growth, (iii) whether exports Granger cause investment. The paper fails to reject the first two hypotheses, while it fails to accept that exports Granger cause investment. In addition to the analysis of the 1977-2003 period, the paper looks briefly also at the impact of the economic reform undertaken in 1991, and whether the ELG hypothesis still holds during the 1991-2003 sub-period.

## **Résumé**

Ce document examine le paradigme de la croissance tirée par les exportations pour l'Égypte, en s'appuyant sur des données historiques recueillies entre 1977 et 2003. Au cours de cette période, l'Égypte a changé de politique économique, passant d'un système basé sur une planification centralisée et l'intervention de l'État, à une économie de marché. Le document utilise divers outils d'analyse, notamment l'analyse de co-intégration, les tests de causalité de Granger et de racine unitaire, associés aux analyses de l'auto-régression vectorielle et de la fonction de réponse impulsionnelle. Le document émet trois hypothèses pour tester le paradigme de croissance tirée par les exportations en Égypte : i) le PIB, les exportations et les importations sont co-intégrés ; ii) les exportations soumises au test de causalité de Granger entraînent la croissance ; iii) les exportations soumises au test de causalité de Granger entraînent l'investissement. Le document ne rejette pas les deux premières hypothèses, mais il ne reconnaît pas que les exportations soumises au test de causalité de Granger entraînent l'investissement. Outre, l'analyse de la période 1977-2003, le document examine brièvement l'incidence de la réforme économique entreprise en 1991, et s'interroge quant à la pertinence de l'hypothèse de la croissance tirée par les exportations pour la période allant de 1991 à 2003.

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## Chapter I: Introduction

Exports of goods and services represent one of the most important sources of foreign exchange income that ease the pressure on the balance of payments and create employment opportunities. An export led growth strategy aims to provide producers with incentives to export their goods through various economic and governmental policies. Its also aims to increase the capability of producing goods and services that are able to compete in the world market, to use advanced technology, and to provide foreign exchange needed to import capital goods. Exports can increase intra-industry trade, help the country to integrate in the world economy and reduce the impact of external shocks on the domestic economy. Experiences of Asian and Latin American economies provide good examples of the importance of the export sector to economic growth and development, which led economists to stress the vital role of exports as the engine of economic growth.

In 1991, Egypt witnessed a radical shift from a central planning philosophy that dominated economic policy since 1952. Towards the end of the central planning period, the Egyptian economy faced budget deficits of more than 20% of GDP, inflation rates of more than 19%, an overvalued exchange rate, a staggering external debt, an inefficient public sector, and rapid population growth. Hence, in 1991, the government of Egypt embarked on fiscal and monetary policies to restructure the economy and to overcome the main bottlenecks that were facing the economy during the 1970s and 1980s. One of the main elements of the reform program was to embark on an export led growth (ELG) strategy.

The role of exports in the economies of developing countries has been subject to a wide range of empirical and theoretical studies. However, there have been disagreements among economists concerning the applicability and validity of the ELG theory. Though the export sector has been playing an important role in Egypt's economic development, even before the 1991 reform program, there is no study testing the validity of ELG in Egypt. The main intention of this paper is to analyze the impact of exports on Egypt's economic growth during 1977 to 2003. The paper utilizes advanced econometric techniques to test the ELG theory, via three hypotheses: i) whether exports, imports and GDP are cointegrated; ii) whether export growth Granger causes GDP growth, and (iii) whether export growth Granger causes investment growth. We also use vector auto regressions (VARs) and impulse response functions (IRFs) to investigate the impact of macroeconomic shocks.

The contribution of this research not only examines the effectiveness of Egypt's export driven strategy but also evaluates the effectiveness of various economic policies adapted since 1975, aiming at the promotion of exports of goods and services. The findings will help policymakers to evaluate various economic policies, including their impact on foreign exchange, tariff and non-trade barriers, the role of income taxes, the reform of the public sector, and other policies and regulations that directly affect the performance of the export sector.

The study is structured into six chapters. Following this introduction (Chapter I), Chapter II provides a literature review of related theoretical and empirical studies. The third chapter provides then some background specific on Egypt. Chapter IV outlines the methodology used to examine the above-mentioned relationship. The fifth chapter provides a summary of the findings, and Chapter VI contains some conclusions and policy implications.

## **Chapter II: Literature Review**

The argument concerning the role of exports as one of the main deterministic factors of economic growth is not new. It goes back to the classical economic theories by Adam Smith and David Ricardo, who argued that international trade plays an important role in economic growth, and that there are economic gains from specialization. It was also recognized that exports provide the economy with foreign exchange needed for imports that cannot be produced domestically. The ELG paradigm has received renewed attention following the highly successful East Asian export-led growth strategy during the 1970s and 1980s, and especially if compared to the overall failure of import substitution policies in most of Africa and Latin America.

Given the huge size of the export-led growth literature, we have limited our literature review by referring first to some highly influential studies that provide a useful framework for the analysis of the ELG paradigm, second some of the major studies specifically for developing countries, and third, some empirical studies. The empirical studies are further divided based on their purpose and approach. A more detailed review of the empirical literature can also be found in Subasat (2002).

There are several influential studies that provide a useful framework for analyzing the relationship between exports and economic growth, i.e., Baldwin and Forslid (1996), Feenstra (1990), Segerstrom, Anant and Dinopoulos (1990), Grossman and Helpman (1990), and Rivera-Batiz and Romer (1991). The basic idea of this literature is that exports increase total factor productivity because of their impact on economies of scale and other externalities such as technology transfer, improving skills of workers, improving managerial skills, and increasing productive capacity of the economy. Another advantage of export-led growth is that it allows for a better utilization of resources, which reflects the true opportunity cost of limited resources and does not discriminate against the domestic market.

There are also many studies analyzing the role of exports in the economic growth specifically for developing countries. Most of these studies conclude that there is a positive relationship between exports and economic growth, for example, Balassa (1978 and 1985), Jung and Marshall (1985), Ram (1985 and 1987), Chow (1987), Shan and Sun (1988), Bahmani-Oskoei, Mohtadi and Shabsigh (1991), Bahmani-Oskoei and Alse (1993), Jin (1995), Levin and Raut (1997), and Khalifa Al-Youssif (1997). Most of this literature attributes the effects of exports on economic growth to several factors. One of the key factors however is that exports promote threshold effects due to economies of scale, increased capacity utilization, productivity gains, and greater product variety. It is

also argued that exports of goods and services provide the opportunity to compete in the international markets that leads to technology transfer and improvement in managerial skills. Indeed, a recent review by Gunter, Taylor and Yeldan (2005) concludes that any gains from trade liberalization are often associated with external effects that are dynamic in nature.

There are large numbers of empirical studies that confirm the strong association between exports and economic growth. We can divide empirical studies that aim to assess the relationship between export and economic growth into two groups. The first group use cross-country analysis, of which key contributions are: Michaely (1977),<sup>1</sup> Tyler (1981), Feder (1982), Kavoussi (1984), Ram (1985), Begum and Sheehey (1990), Lopez (1991), Edwards (1992), Shamsuddin (1999), and Ngoc, Phuong Anh and Nga (2003). Most of the cross-country studies tend to confirm the importance of exports for developing nations. Yet, there are some doubts concerning the importance of trade openness. For instance Clarke and Kirkpatrick (1992) use pooled data for 80 developing countries from 1981-1988 to estimate the impact of trade policy reform on the economic performance and conclude that trade reform does not affect economic performance. Sheehey (1992), limiting the analysis to 53 non-oil developing countries, finds that the positive impact of exports is only important for the industrialized economies. The second group analyzes single country experiences. These studies, many of which were financed by research projects of international organizations, usually emphasize a positive and significant relationship between export expansion and economic growth.

There are also various studies that address the important issue of export composition. Crespo-Cuaresma and Wörz (2003), Fosu (1990), Greenaway, Morgan and Wright (1999), Harrison (1996), Hussain (1998), Srinivasan and Bhagwati (2001) argue that exports of manufacturing products are less sensitive to the cyclical changes in the international market compare to exports of raw and intermediate goods. Hence, countries that depend on the exportation of manufactured products are less affected by the cyclical changes in the world economy. Indeed, a major problem facing most developing countries is there heavy dependency on the export of raw materials. Changes in the world economy affect its demand for primary products, which then affects the economic performance of less developed countries.

There are large differences among the empirical studies with regards to statistical techniques used. According to Sharma and Panagiotidis (2005), we can distinguish between three methods: (a) using the correlation between exports and GDP; (b) using the aggregate production function with exports as explanatory variable; and (c) emphasizing the existence of threshold effects. Sharma and Panagiotidis (2005) also point out that the econometric methods used in most of the empirical investigations are dominated by the work of Granger (1969, 1988), Sims (1972), Engle and Granger (1987), Johansen (1988, 1995) and Johansen and Juselius (1990).

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<sup>1</sup> Michaely (1977) used a sample from 41 developing countries for the period of 1950 to 1973, whereby he finds a positive and significant relationship between exports of goods and economic growth, though he also points out that exports performance affects growth only when countries reach minimum level of development.

Concerning the causality between exports and economic growth, given that exports represent one of the main components of GDP, the direction of causality may run from exports to growth and visa versa. Several empirical studies find no conclusive evidences on the causal relationship between exports and GDP growth. These studies cover developing and emerging economies including Hong Kong, Korea, Mexico, Singapore, and Taiwan. Ruiz-Nápoles (2001) argues that even in the cases where we have a positive effect of increasing exports on production expansion, such effect may be limited and offset by increasing manufacturing imports displacing domestic production. Time series evidence fails to provide a conclusive support to ELG hypotheses whereas wide ranges of cross sectional studies support the positive and strong association between exports and growth. In other words, time series studies find less conclusive association between exports and growth whereas; cross section researches appear to support the positive relationship.

### **Chapter III: The Case of Egypt**

During 1956 to 1974, Egypt followed a centralized economic philosophy, which led to major macroeconomic imbalances, and hindered the country's ability to keep up with high population growth. The year 1974 marked the starting point for serious changes in the Egyptian economy. In that year, President Sadat initiated the 'Open Door Policy' ('Infitah'). This policy aimed to encourage investment, especially in the private sector; thus, it marked the beginning of the transition of the economy from a central and comprehensive planning approach to a market-oriented economy. This shift made the economy to record a rapid growth of GDP, averaging 9% per year during the period 1974-1980. As the sectoral breakdown of growth shows, the rapid increase in the flows of external resources, partly linked to mega-projects and the petroleum sector, was a key factor behind this rapid GDP growth.

- Petroleum: 25.5%
- Suez Canal: 42.8%
- Trade: 17.0%
- Government Services: 9.9%
- Agriculture: 2.5%
- Industry: 6.2%

Source: See Handoussa (1991).

Despite the rapid growth rates during this period, the Egyptian economy suffered from major macroeconomic problems, for instance following the 1973 war, Egypt's public debt reached about \$6.3 billion compared to \$1.7 billion in 1970. Imports increased by about 350% during 1974-79, due to sharp increases in the imports of capital and intermediate goods. Another reason for the surge in external debts was a result of a rapid increase in military expenditures during 1977-1981.

In 1982, President Mubarak called for an economic conference to discuss the alternative solutions available to deal with existing problems of high budget deficits, high inflation,

high debt, and balance of payment problems among other social and political problems. The conference concluded that it is important to increase domestic and foreign savings, to control imports of luxury goods, and to reduce government expenditures. Accordingly, the government agreed in its first five-year plan (1982-1987) to rely on domestic capital and to reduce external borrowing; see Amin (1998) for further details. However, this did not happen due to two twin macroeconomic imbalances, one between investment and domestic savings, and another one between imports and exports.

During 1982 and 1988, the domestic gap averaged about 10% of GDP and was mainly due to the decline of public sector savings (as a result of a decline in oil revenues), and the fall of private sector savings (that were held down by negative real interest rates). As for investment, given that most of the funds went into infrastructure rather than into the production of traded goods. This pattern of investment contributed to the gap between exports and imports, which averaged about 3-4% of the GDP during the same period. It was clear that this gap was a result of increasing imports faster than exports. In order to deal with both gaps, Egypt had to borrow from abroad, thus, Egypt's "self-reliance" did not occur and the external debt increased further instead of falling. In 1986, Egypt's external debt amounted to around \$37.8 billion, which coupled with a decline in all other exogenous resource inflows led to a marginal GDP growth rate of about 1%, far below a population growth rate (2.7%), hence, negative GDP per capita growth.

The performance of the export sector had been influenced by tariff and non-tariff barriers (NTB). Tariff rates and other import duties were used to protect the domestic industry and to promote an import substitution strategy. On the other hands, exporters saw the price of their exports fall relatively to the prices of both the tariff protected import-competing goods and the non-traded goods (though to a lesser extend).

Based on Kheir-El-Din and El-Shawarby (2000), estimate the export tax equivalent of imports, which implies that if the average tariff in Egypt is taken to be 20.2%, the equivalent export tax would be 13.9%. Therefore, the custom duties on imports would have an equivalent export tax of about 10 to 14% plus about 3% to 4% of supplementary charges. In addition, import tariffs of inputs used by producers of other goods or services represent an additional cost for exporters. Based on the 1997 tariff structure, the additional cost to manufacturing was 2.7% and 4.8% for agriculture. Egypt's custom duties and tariff rates were very high compared to other developing and emerging economies, which eventually led to falling productivity, a diversion of resources and investments from the industrial sector and increasing unemployment. NTBs, include import bans, import deposits, unclear rules and regulations coupled with corruption, and non-tariff barriers on exports, represented another set of bottlenecks for exporters. The non-tariff export barriers include banning more than 20 commodities from exporting (i.e., foodstuffs and folders, raw hides and skin, waste paper and paperboard, low grade cotton and scrap metals). Finally, multiple exchange rates<sup>2</sup> and an overvalued currency were

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<sup>2</sup> Prior to 1991, Egypt had multiple exchange rates. The first rate was the Central Bank rate of .7L.E/\$ for the period of 1979 to 1989, devalued to 1.1 L.E/\$ and 2.0 L.E/\$ in 1990. The second rate was the commercial bank rate of .83 L.E/\$ lasted for the period 1982 to 1989, and the third rate is called the pool rate traded at premium rate.

additional problems facing Egyptian exports because an overvalued currency discriminates against the domestic production in general and against tradable goods in particular.

In 1991, Egypt signed an economic reform and structural adjustment program with the International Monetary Fund (IMF). The stabilization and economic reform program encompassing trade liberalization, fiscal reform, privatization, and deregulation besides removing price distortion. The structural adjustment program aims to restructure the economy, reduces the inefficiency, and enhances the role of the market. This require that the government to undertakes serious steps in reforming the public sector, financial sector, commercial banks, and provide private sector with the incentive to be able to lead the development processes.

The Egyptian economy made significant improvement with the macroeconomic stabilization as well as with structural reforms. Budget deficits reduced considerably, inflation rates were reduced to about 2.5%, and debt service indicators showed substantial improvement. The Egyptian pound was devalued in 1991 to reach 3.4 L.E/\$, and for the period of 1991 to 1997, Egypt had a stable exchange rate, with foreign exchange reserves of more than \$ 20 billion in 1997. Things changed however with the Asian financial crises. The Egyptian economy was not able to sustain the external shocks coupled with the rapid increase in the imports bill. The government had to devalue the pound a couple of times, until reaching an exchange rate of 5.81 L.E/\$ in 2004/2005. Though the relationship between exchange rates and the export is overall controversial, there is, according to Kheir El-Din and El-Shawarby (2000), conclusive evidence on the weak role of exchange rate variation on Egyptian export performance.

The reform program emphasized the importance of the trade sector through various measures aimed to liberalizing foreign trade, including the removal of export controls and a reduction in import tariffs, particularly on capital goods and inputs.<sup>3</sup> The country engaged in various trade agreements with the European Union (EU), the Arab Free Trade Area (AFTA), and the agreement to establish a Common Market for Eastern and Southern Africa (COMESA). As a result of the various reforms, Egypt's exports have increased from \$1.5 billion in 1992 to \$2.9 billion in 2002. Accordingly, its share of total exports in GDP has increased from 37% to 43% during the same period. This is far higher than the 25 percent average of other developing countries. Progress was also made in the financial sector and with privatizations.

## **Chapter IV: Methodology**

In order to test for the validity of the ELG theory and its applicability to Egypt, the paper establishes three hypotheses (i) whether GDP, exports and imports are cointegrated, (ii) whether exports Granger cause growth, (iii) whether exports Granger cause investment. (iii) Weather export, import, and GDP are cointegrated. Finally, the paper uses the IRF to see the impact of the external shocks on the variables. The results of this analysis will enable us accepting or rejecting the validity of ELG model to Egypt. The advantage of

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<sup>3</sup> See Kheir-El-Din and El-Shawarby (2000).

this approach is to envisage the role of export in economic growth, and to test for the long-term relationship between, import, export, and investment. The VAR also used to test for the impulse response due to the external shocks. The study covers the period 1977 to 2003; the data used are the following:

1. Real gross domestic product (GDP)
2. Real GDP without exports (NGDP)
3. Net exports (X-M)
4. Real exports
5. Real imports
6. Real gross capital formation

The data for the above variables were obtained from the IMF's International Financial Statistics. All data are in real terms, using the GDP deflator. The study follows that of Feder (1982), dividing the economy into two sectors, an export and a non-export sector. We isolate the "economic influence" upon the export sector by incorporating the growth accounting approach used to measure GDP, following the approach used by Sharma and Panagiotidis (2005). The approach allows us to test the validity of the ELG theory through testing the following three hypotheses: (i) whether exports, imports and GDP are cointegrated, using the Johansen approach; (ii) whether export growth Granger causes GDP growth and (iii) whether export growth Granger cause investment. Vector autoregressions (VARs) and impulse response functions (IRFs) are further used to investigate the impact of macroeconomic shocks.

In addition to the analysis of the whole time period (1977-2003), some of the analysis has been redone for the period of 1991 to 2003. This allows us to see whether the economic policy changes of 1991 had an affect on the role of exports as a major source of economic growth.

## **Chapter V: Analysis of Results**

### **V.1. Unit Roots and Cointegration**

The unit root test is important because it allows to examine whether a time series is stationary or not. Knowing the existence of a time series' stationarity is essential for three main reasons. First, a fundamental question in the ARIMA modeling of a single time series is the number of times the series needs to be for the first differenced before fitting the ARIMA modal because each unit root requires a differencing operation. Second, stationarity in regression model is assumed in the derivation of standard inference procedure. Nonstationarity of regression model invalidates the standard results. Third, one of the most important question in cointegration is whether the disturbance term of the cointegrating vector has a unit root.

Dealing with time series, special consideration needs to be given to the data generating process (DGP) with trend, cycle, and seasonality and removing these deterministic patterns the remaining DGP should be stationary. There is a need to test for random walk or to test for stationarity for time series with DGP, which it is called the unit root test.

Using unit root test for time series is a process because if we find that the data is not stationary, the original data is differenced and then we perform the test again. In this way, we will be able to identify the order of the integrated process for each time series. It is important to mention that one of the reasons of using unit root test reveals itself when the ordinary least square (OLS) regression with high adjusted R-square and very low Durbin-Watson value.

Since the Augmented Dickey and Fuller (ADF) test is used in this paper, which requires that the error correction model to be individually independent and homogeneously distributed, the purpose of the unit root test is to determine whether the series is consistent with an I (1) process with a stochastic trend, or if it is consistent with an I (0) process that is stationary with deterministic trend. This means that a vector of I(1) variables  $y_t$  is said to be cointegrated if there exist a vector  $B_1, \dots, B_{Y_t}$  is trend stationary. If there exist  $t$  such linearly independent vectors  $B_{t, t=1, \dots, t}$  then we say that  $y_t$  are said to be cointegrated with rank  $t$ . The matrix  $B = (B_1, \dots, B_t)$  is called cointegrating matrix.

The hypotheses can be formulated as:

$$\Delta Y_t = \eta + bt + \beta Y_{t-1} - \alpha I \Delta Y_{t-1} + \varepsilon_t \quad (1)$$

$$H_0 : (\eta, b, \beta) = (\eta, 0, 0) \dots v$$

$$H_1 = (\eta, b, \beta) \neq (\eta, 0, 0)$$

According to the value of the test, we can accept or reject the hypothesis of random walk. For the purpose of the study the ADF test has been used, which is based on the Schwarz Information Criterion, while the Philips Person (PP) test bandwidth is based on Newey-West. Table (1) shows the results of unit roots test for level and first difference of ADF and PP. The results indicate that all variables chosen for the purpose of this paper are stationary. It shows the ADF test for level and first differences as well as the PP Test. The results show that all variables are stationary of I (1), and have no deterministic trend.

**Table 1: Unit Root Tests, 1977-2003**

Variable	Level ADF statistic*	Level PP test statistic*	First Difference ADF test statistic**	First Difference PP test statistics**
NGDP	1.875863	1.426577	4.198536	4.225046
Exports	1.159231	3.616963	3.616963	3.616963
Imports	2.280350	3.993874	4.274133	3.993874
Investment	0.928485	5.363575	5.414237	3.363575
Employment	7.292345	2.165184	7.292345	2.165184

\* Significant at 5% critical value (no trend).

\*\* Significant at 5% critical value (trend and intercept).



**Table 3: Cointegration test for Ln NGDP, Ln Exports and Ln Imports (1977-2003)**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 critical Value	Prob.**
None	0.526492	29.22651	42.91525	0.5484
At most 1	0.300845	11.28443	25.87211	0.8585
At most 2	0.106225	2.695234	12.51798	0.9106

Trace test indicates no cointegration at the 0.05 level.

\*\* denotes rejection of the hypothesis at the 0.05 level.

\*\* MacKinnon-Haug-Michelis (1999) p-values.

The cointegration analysis between exports, imports and GDP for the 1991-2003 sub-period is displayed in tables 4 and 5. Tables 4 and 5 support the previous findings of rejecting the null hypothesis of no cointegration between GDP, exports, and imports. , In other words, the results confirm the previous findings of a long run relationship between GDP, exports, and imports; and between net GDP, exports, and imports. The results also suggest that the role of exports under the 1991 reform program does not differ fundamentally from the whole period of the study.

**Table 4: Cointegration test for Ln GDP, Ln Exports, and Ln Imports (1991-2003)**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value0.05	Prob.**
None *	0.961526	61.64364	42.91525	0.0003
At most 1	0.755176	22.55048	25.87211	0.1227
At most 2	0.376241	5.663904	12.51798	0.5041

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level.

\* denotes rejection of the hypothesis at the 0.05 level.

\*\* MacKinnon-Haug-Michelis (1999) p-values.

**Table 5: Cointegration test for Ln NGDP, Ln Exports and Ln Imports (1991-2003)**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.983163	63.27649	42.91525	0.0002
At most 1	0.659478	18.35083	25.87211	0.3208
At most 2	0.446217	6.500808	12.51798	0.3995

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level.

\* denotes rejection of the hypothesis at the 0.05 level.

\*\* MacKinnon-Haug-Michelis (1999) p-values.

### V.3. Granger Causality

The purpose of this section of the analysis is to test whether export Granger cause GDP and to test also the Granger causality between exports and investment in Egypt for the

period 1977 to 2003. We perform the test by estimating the bivariate autoregressive process for GDP and net GDP with exports. The reason for this investigation is to perform an empirical testing for the ELG hypothesis with special reference to Egypt. In addition, building in our previous analysis, it can be argued that there is a strange relationship between exports and gross domestic investment, especially if there is a productivity differences between exports and non exports sector investment is expected to increase in the sector with high productivity and return or maybe investment in basic infrastructure encourages investment in the export sector. The Granger causality test is based on the following idea:

$$\Delta Y_t = \eta + \beta_1 \Delta Y_{t-1} + \dots + \beta_l \Delta Y_{t-l} + \beta_3 \Delta X_{t-1} + \dots + \beta_4 X_{t-1} \quad (3)$$

$$\Delta X_t = \eta + \beta_1 \Delta X_{t-1} + \dots + \beta_2 \Delta X_{t-1} + \beta_3 \Delta Y_{t-1} + \beta_4 Y_{t-1} \quad (4)$$

The reported F-statistics are the Wald statistics for the joint hypothesis:

$$b_1 = \dots = b_l = 0$$

The first null hypothesis is that exports (X) do not Granger cause GDP (Y). The second null hypothesis is that NGDP (Y-X) does not Granger cause exports (X). The third null hypothesis is that exports (X) do not Granger cause investment (I).

Tables 6, 7 and 8 indicate that we cannot reject the null hypothesis that exports Granger causes GDP, nor that exports Granger cause NGDP (both at the 5% level of significance). With regards to the relationship between exports and investment, the analysis shows that we accept the null hypothesis that exports do not Granger cause investment, indicating that there is no evidence between exports and investment in the case of Egypt. It is important to note, that we used a one-year lag for all the variables used.

**Table 6: Granger causality between exports and GDP (1977-2003)**

Null Hypothesis:	Obs.	F-Statistic	Probability
LOG(X) does not Granger Cause LOG(GDP)	24	3.67682	0.04469
LOG(GDP) does not Granger Cause LOG(X)	24	1.05612	0.36735

**Table 7: Granger causality between exports and NGDP (1977-2003)**

Null Hypothesis:	Obs.	F-Statistic	Probability
LOG(NGDP) does not Granger Cause LOG(X)	24	1.09827	0.35370
LOG(X) does not Granger Cause LOG(NGDP)	24	4.05957	0.03404

**Table 8: Granger causality between exports and gross investment (1977-2003)**

Null Hypothesis:	Obs.	F-Statistic	Probability
LOG(X) does not Granger Cause LOG(CF)	25	0.80249	0.38005
LOG(CF) does not Granger Cause LOG(X)	25	0.00278	0.95844

Tables 9, 10, and 11 test for the Granger causality between exports, capital formation and GDP for the 1991-2003 sub-period, which once again confirm the previous results that GDP Granger causes exports and that exports Granger cause NGDP, and thus, we fail to reject the null hypothesis of non Granger causality between exports and GDP. On the other hands, we also fail to accept the causality between exports and investment for the 1991-2003 sub-period. In conclusion, the above findings support the validity of ELG theory for the case of Egypt for the whole period of the study (1977-2003) as well as for the 1991-2003 sub-period.

**Table 9: Granger causality between exports and GDP (1991-2003)**

Null Hypothesis:	Obs.	F-Statistic	Probability
LOG(X) does not Granger Cause LOG(GDP)	13	1.01980	0.33638
LOG(GDP) does not Granger Cause LOG(X)	13	6.29953	0.03092

**Table 10: Granger causality between exports and NGDP (1991-2003)**

Null Hypothesis:	Obs.	F-Statistic	Probability
LOG(NGDP) does not Granger Cause LOG(X)	12	0.11611	0.74111
LOG(X) does not Granger Cause LOG(NGDP)	12	6.19873	0.03444

**Table 11: Granger causality between exports and gross investment (1991-2003)**

Null Hypothesis:	Obs.	F-Statistic	Probability
LOG(X) does not Granger Cause LOG(CF)	13	2.99176	0.11438
LOG(CF) does not Granger Cause LOG(X)	13	3.03061	0.11233

#### V.4. Vector Autoregression (VAR) and Impulse Response Function (IRF) Analysis

A vector autoregression (VAR) model was used to show the dynamic effect of the impact of unitary shocks on a variety of macroeconomic variables. Since the variables are neither stationary nor cointegrated, the first differences of the variables are used. The main purpose of using the VAR model is to analyze the impact dynamic of random disturbances on the system. The following equation shows the mechanism of the VAR model:

$$\Delta Y_t = \alpha_1 \Delta Y_{t-1} + \dots + \alpha_p \Delta Y_{t-p} + B \Delta X_{t-1} + \varepsilon_t \quad (8)$$

where  $Y_t$  is a vector of endogenous variable where  $X_t$  is a vector of exogenous variables,  $\alpha_1, \dots, \alpha_p$  and  $\beta$  are metrics of coefficients to be estimated and  $\varepsilon_t$  is the vectors of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right hand side variables. GDP, exports and gross domestic investment are the endogenous variables, while the other variables are exogenous. The design model is the one that minimizes the Akaike Info Criterion (AIC) and the Schwartz Bayesian Criterion BIC Criteria. (BIC).

Based on this VAR model, the analysis is then extended to include the impulse response functions (IRFs). A shock to one variable not only directly affects that variable, but is also transmitted to all of the other endogenous variables through the dynamic (lag) structure of the VAR. An impulse response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. If the innovations are contemporaneously uncorrelated, interpretation of the impulse response is straightforward. The  $i$ th innovation is simply a shock to the  $i$ th endogenous variable. Innovations, however, are usually correlated, and may be viewed as having a common component, which cannot be associated with a specific variable, which is however taken care off with the so-called Cholesky decomposition.

It is important to note, that that IRFs are a conceptual experiment. Actually, we are interested in examining the impact of the consequences of introducing a shock to the system. As our IRF analysis indicates, we observe that one positive shock to GDP leads to positive response from exports, which dies out in period 7, while the shock to GDP from imports produces continuous responses. In the second graph, a positive shock to capital formation leads to a positive response from GDP, exports, and imports, though they die out in period 6 for GDP, period 7 for investment, and period 8 for exports. Positive shocks to exports lead to a negative response from GDP and investment and they die out in period 5. In addition, positive shocks to imports lead to a positive response from GDP and exports. This supports the previous argument of exports' significant role on Egypt's economic growth during 1977-2003. While the strong relationship between GDP growth and exports is—in the case of Egypt—due to an increase in exports, it is important to note that Egypt still depends on the exports of raw materials, mainly agricultural products.

IRFs used as a conceptual experiment analyzing the impact of a one standard deviation (SD) positive shock of exports, leading to a positive response from GDP that lasts for only a few periods. On the other hand, there is significant response to the economic system as a result of introducing an export shock to the system. The significant response supports the arguments of positive a weak relationship between exports and growth, and thus we fail to rejects the applicability of the ELG hypothesis for the case of Egypt.

## **Chapter VI: Conclusion and Policy Implications**

The purpose of this study was to test the applicability of the export led growth (ELG) hypothesis for the case of Egypt during 1977 to 2003. Hence, it includes some years before and after Egypt's transformation, which emerged with the structural adjustment and reform program Egypt signed with the IMF in 1991. The comprehensive economic reform program emphasized an ELG strategy, a reduction of government interventions in the economy, policies that encourage private domestic and foreign investments, and other polices that aim to enhance efficiency and better allocation of resources.

The paper tested if whether exports, imports and GDP are cointegrated using Johansson approach; whether exports Granger cause GDP growth; whether export Granger cause domestic investment. Our results support the hypothesis exports, imports and GDP are

not cointegrated, and that exports Granger cause GDP growth, but they do not support the Granger causality between exports and capital formation. The paper also used vector autoregressions (VARs) and impulse response functions (IRFs) to investigate the response of the system to economic shocks. The analysis showed that shocks to exports lead to a significant response in GDP, which in return supports the ELG. On the other hand, shocks to exports have a low response on capital formation, supporting the weak relationship between capital formation and exports for the case of Egypt.

Disaggregating between export of good and exports or services, our analysis reveals that exports of goods remain one important source of economic growth despite Egypt's dependency on raw materials. While Government policies towards private sector investment and promotion of exports of non-traditional goods are important to stimulate exports, it is equally important to ensure that the produced goods are able to compete internationally in terms of quality and prices, whereby Egypt has a great potential and comparative advantages in textiles.

The policy implication of the positive association between exports and economic growth reveal that economic reform policies and the shift towards a free market has helped the economy to reallocate its resources to productive uses. Yet, there remain a variety of issues that need to be addressed, including further trade liberalization, further tariff revisions, non- tariff barriers, exchange rate policies, the building up of an efficient service infrastructure.

Despite the Government's efforts in reforming tariff and custom duties services, there is need for further tariff reduction because the average tariff rates of all tariff line is about 20% which is very high compare with other countries. Abolishing all non-trade barriers on import and export is another important issues facing the government, for instance the request to provide the letter of credit of 100% from the importers has a direct impact on the demand for foreign exchange. It led to create the black market of foreign exchange, which eventually increases the cost of inputs and thus prices of the goods and services. It is important to mention, that Egypt has taken serious steps to phase out most of tariff and non- tariff barriers on imports and exports besides solving most of the problems that have been facing exporters at the ports and red tape. Furthermore, exchange rate stability is another important economic policy, as it does not only affect imports and exports but also FDI, and the stock market. Finally, it needs to be stressed that the provision of an adequate infrastructure is another important concern for the business communities. Given that the Government has started to give more attention for establishing an adequate infrastructure, it is anticipated that this will have positive impacts on exporters and FDI, and thus finally also on growth.

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