MANUFACTURED EXPORTS AND ECONOMIC GROWTH IN EGYPT: COINTEGRATION AND CAUSALITY ANALYSIS TORAYEH, Neveen M.*

Abstract

Although it is widely acknowledged that exports, particularly through manufactured components, play an important role as a potential source of economic growth, the relationship between exports and economic growth is still ongoing. This paper contributes to this controversy using cointegration analysis and Error Correction Model (ECM) test to determine the short and long run causality between manufactured exports and economic growth in Egypt during the period 1980-2008 with particular interest to decompose Egypt's manufactured exports into a number of key industries. The empirical results show that bi-direction long-run causality exists not only between exports of manufactured goods as a whole and economic growth but also in case of few Egyptian export industries like textile products, chemical products, fabricated metal products and food-processing. Furthermore, the short run unidirectional causality from exports of some industries to economic growth is explored. The direction of causality from growth to exports was inferred only in the case of chemical products. The main conclusion is that there is a long run circular causality between manufactured exports and economic growth in Egypt. Therefore, adopting vigorous growth policy is expected to stimulate the manufactured exports. However, the export-led policy seems to be a basic tool toward sustained growth in Egypt. Furthermore, emphasis on the composition of manufactured exports should be considered as a main instrument in the export driving growth policy.

Keywords: Causality . Manufactured exports . Egypt . Cointegration . Error Correction **JEL Classification:** F43. F49 . C32 . O55

1. Introduction

The export-led growth hypothesis (ELGH) postulates that export expansion, especially of manufactured goods, is one of the main determinants of growth. The nature of the relationship between export and growth has been a subject of considerable debate for a long time.

Because of this debate, the question of whether economic growth is export-led or driving to export is long-standing and still far from resolved. The answer that emerges from this question has a very important implication for policy-makers' decisions about the appropriate strategies to adopt. Is it exports led growth? Alternatively, it might be growth-driven exports.

There is large literature on the empirical investigation of the export led growth. This literature has focused on the impact of total exports on growth. However, during the last thirty years, another group of literature affirms that not exports per se matter for growth, but he composition of exports is also crucial. Success in manufactured exports

^{*} The author is an assistance professor in the Department of Economics, Faculty of commerce and business administration, Helwan University, Ein Helwan, Cairo, Egypt. E-mail; neveenmt@hotmail.com.

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has been nearly synonymous with rapid economic growth. The countries that have achieved the most rapid gains in income per capita have also recorded the fastest growth in manufactured exports. The best-known examples are the East Asian countries in which incomes grew by between four-fold (in Southeast Asia) and seven-fold (in the four tigers) on the back of labor-intensive manufactured exports. Several authors hypothesize that dynamic technological spillover effects are mainly associated with the manufactured exports rather than with the primary export.

Manufactured exports can promote high rates of investment into profitable economic activities by fostering closer connections with international firms using leading-edge technologies; In addition, export industries are likely to encourage economic specialization and to provide foreign exchange to finance imports of capital goods that cannot be produced locally. Exporters of manufactured goods are also more likely to demand high standards of service from their suppliers and to exert pressure for improved infrastructure provision, maintenance and management. In addition, manufactured export markets allow labor and capital to move rapidly from low to high-productivity sectors without encountering diminishing returns.

Egypt has comparative advantage in material-based manufacturing, which is typically low-skill labor intensive. The RCA is high for many low-skill labor-intensive products such as garments, Mineral Fuels, Lubricants & Related Materials and Chemicals & Related Products; their RCA is greater than one.

Otherwise, RCA is very low in high-skill labor-intensive products. Although Egypt recently has started to gain factor-based comparative advantage in industries that make intensive use of capital and semi-skill labor, unfortunately, there is a virtual absence of comparative advantage in high-skill intensive products. Having the manufactured exports sector that is largely resource- based, or has a relatively low technology content, and yet under-performs in medium- and high-tech exports, the capability of this manufactured export structure for hitting a sustainable economic growth must be inquired.

At this context, the analysis here is placed to ascertain the validly of the exportled growth hypothesis for Egypt during the period 1980-2008. We do not focus on total exports per se, but we go beyond the traditional literature by addressing the impact of the manufactured exports. Further, the analysis will go beyond that point to decompose Egypt's manufactured exports into key categories.

The rest of this paper is structured as follows: Section 2 provides an overview of the Egyptian manufactured exports. Section 3 briefly reviews the empirical literature on the export-led growth hypothesis with shedding light on manufactured exports. Section 4 outlines the data sources and provides a description of the specific model investigated in this paper. It also presents in detail the methodology and formal techniques employed. The empirical results are reported and explained in section 5. Finally, in section six a discussion of implications of the results and some summary conclusions have been presented.

2. Overview of Egypt's manufactured exports

One of the chronic problems with Egypt's exports over the three past decades was the heavy reliance on petroleum manufacturers and primary products, which made up 70-75% of merchandise.

Recently, product diversification of exports thus became a priority. Egypt moved away from primary products towards more technologically advanced manufactured exports (medium and low technology). There was an attempt to pursue an export-led growth strategy for the past decades. Notably, even with the skyrocketing increase in fuel exports, manufactured exports still account for more than 30 percent of the total value of Egypt's merchandise exports during the last three decades. It is widely notable that the value of total merchandise exports grew by an average of about 26% between 2001 and 2008 compared to 4.7% between 1980 and 2000. Since 2004, Egypt's merchandise exports increased threefold and amounted to US\$26 billion in 2008. Over the last three decades, Egypt's main exported commodities were textile and garments, chemicals and petroleum, basic and fabricated metal and food-processing products. These products accounted for 80% of Egypt's manufactured exports in the average period 1980-2008.

As it is shown from table 1 below, the export of manufactured goods has also risen since the 1990s, from U\$1.180 billion in 1990 to about US\$3.4 billion in 2000. During the period 2000-2008, manufactured exports increased at a higher rate and reached about US\$5.4 billion in 2008. This increase has been mainly the result of the growth in clothing and textile production, which accounted for 40.8% of total manufactured exports in the average period 1980-2008 and about 14.7% of total merchandise exports during the same period. On the other hand, the growth of this exports witnessed some sluggish since 2006 until 2008. Egyptian exports will lose their quasi-guaranteed market access into the EU and US after the ending of the Agreement on Textiles and Clothing (ATC) in 2005.

Years	GDP	Р	Merchant	Х	XT	XM	XC	XF	Unit price index
			dise						of exports
			exports						1990=100
1980	24,057	124,91	3,046	0,620	0,28	0,058	0,042	0,125	65,23
1985	25,078	85,37	3,714	0,616	0,15	0,078	0,087	0,103	79,70
1990	39,412	100,00	4,957	1,180	0,53	0,198	0,181	0,237	100,00
1995	68,894	139,36	3,450	1,950	0,57	0,247	0,139	0,341	105,70
2000	99,601	158,60	4,675	3,394	1,10	0,320	0,123	0,377	115,00
2001	94,438	145,74	4,127	2,266	1,08	0,382	0,131	0,414	120,90
2002	90,064	133,47	4,687	2,987	1,26	0,400	0,216	0,418	118,50
2003	77,109	109,75	6,163	3,775	1,42	0,557	0,334	0,524	108,00
2004	82,429	112,25	7,683	3,208	1,48	0,589	0,365	0,630	104,00
2005	98,323	125,31	10,652	4,010	1,77	0,677	0,263	0,736	104,00
2006	112,152	133,48	13,694	5,329	2,02	0,764	0,536	0,842	104,40
2007	137,520	152,74	16,200	5,267	2,30	0,852	0,717	0,948	104,00
2008	165,546	177,55	26,246	5,433	2,57	0,939	0,738	1,054	101,90

Table 1; the evolution of the main data about GDP and manufactured exports in Egypt

Notes: P= Implicit Price Deflator - US1990=100 ; X= Manufactureed Exports; XT = Textile and Clothing Exports, XM= basic and fabricated metal Exports; XC= Chemical Exports; XF= Food-Processing Exports. All Values are in current prices in Billion US Dollars. The series on GDP deflator and export price index are collected from the International Financial Statistics (IMF). The series on exports values are taken from The UNCTAD Handbook of statistics. The values of GDP are collected from United Nation Statistics Division.

The local TC industry will be exposed to tougher competition from abroad and exports stand to lose footage in major foreign markets. Nevertheless, Egypt has been increasingly focusing on that sector by creating free zones and industrial clusters that heavily attracted manufactures of cotton textile and ready-made clothes. In addition to FTAs with the European Union, COMESA and the Arab World, the creation of qualifying industrial zones (QIZs) under an agreement signed with the US and Israel in 2004, has given the country duty free access to the US market. However, Egypt's good price and quality positioning will help, but the country will still have struggle on its hands to hold on to market share against competition when the sector becomes fully integrated into the WTO and all quotas are phased out in 2005¹.

As Table 1 reveals, textiles and clothing industry reported a growth of 15% in average of 2005-2008 versus 12% in average of the entire period 1980-2008².

The figures in Table 1 above, denotes unsteady annual growth in the chemicals products during the period 1980-2008. As it is known, for industries that have a large cost share of oil, such as petroleum refinery and industrial chemicals, oil price shocks mainly affect supply.

The chemical industries in Egypt is related o the fluctuations in world oil prices. For example, the world oil slump of the mid-1980s reduced the oil sector's share of export earnings ,which shrinks the capacity of related petroleum industries to export. Shocks to the oil market arising from the 1991 conflict in Iraq presented Egypt with both challenges and opportunities. During that time, Egypt--by the prompting of the IMF--began to reform its fiscal policies and set plans in motion to privatize many of its major industries. By this time, there had been important advances in Egypt to encourage the chemical and petrochemical exports. Nine years ago, since 2001, under the auspices of the Ministry of Trade and Industry, the Egyptian government began offering incentives for chemical and petrochemical companies to export goods. An increase in exports has drawn greater attention to this sector, which has had the benefit of "increasing foreign investment in these sectors, especially, Europe serves as Egypt's main export market. The table reveals that Egypt's exports of chemical products reached \$181 million in 1990 up from \$42 million in 1980. Furthermore, the figure in table 1 illustrates a substantial increase from 2006 when exports amounted to \$536 million. Growth of exports in this sector continues to reach \$738 million in 2008 when the sharp rises in oil prices during 2004-2008 have bolstered the government's decision to provide incentives to exporters who have seen their profit margins dwindle with the rising cost of raw materials³

However, the exports of chemical industries have grown to represent about 9.2% in total manufactured exports in the average of 1980-2008.

The figures in table 1 implicitly show that after a slow or even negative growth in the exports of basic and fabricated metal along two past decades, this industry started to

¹ In the longer-term, BMI believes Egypt will continue to remain a significant player in the world textiles and clothing industry, but says new investment and specialization are main key requirements if Egypt is to hold its own against potential competitors (Business Monitor International, BMI, 2009)

² Government objectives are to continue current growth level (15%) in textiles and ready-made garments to reach USD 10 billion in exports by ,2020 (General Authority for Investment (GAFI), 2010)

³ Kojima, (2009). Extractive Industries for Development Series #10. World Bank.

flourish in recent years. From 2003 to 2008, basic and fabricated metal exports grew sharply, from \$557 million to \$939 million. Behind much of the industry's recent success has been the construction boom in the Gulf. Additionally, Egypt's partnership agreement with the EU, which came fully into force in June 2004, should result in a significantly larger volume of steel's trade. Further, several foreign firms decided to seize the opportunities offered by Egypt's booming construction market and are currently establishing a number of real estate projects ,which create international demand for the Egyptian steel industry ⁴

On the other side, the exports of food processing in Egypt grew slowly, falling in some years; these exports started to make a strong showing only from 2003. Food processing exports nearly doubled in value, however, between 2001 and 2008, from US\$414 million to US\$1.054 billion. The recent success in processed food exports can be attributed to recent combination of government assistance and private-sector expertise that succeeded in upgrading the industry of some goods such as frozen vegetables, dairy products, juices, herbs and spices, and confectionery. Moreover, European partnership agreements with Egypt are one of the main forces behind the country's strategy to improve its food-exporting sector.

In summing up, given the current structure of manufactured exports that prevailed Egypt over the last four decades, to achieve fast growth with higher export competitiveness, several policies need to be implemented. Is it exports-biased policies or macro-economic policy to attract resources and investment into export sector? Therefore, testing the manufactured export contribution to economic growth should be taken with some cautions.

Consequently, the study employs cointegration framework and error correction approach to determine the short and long run dynamics between manufactured exports (as a whole and its key category) and economic growth in Egypt during the period 1980-2008. That is to say, we examine the ELG hypothesis for each category of manufactured exports separately.

3. Literature Review

The relationship between export and economic growth in developing and developed countries has been of continuing interest both in theoretical and empirical literature. So far, only a few papers have studied the relationship between manufactured export and economic growth. However, a large number of empirical studies have conducted during the last two decades to investigate the export-led growth hypothesis; the emphasis has been put on the aggregate level of export. These studies have been classified into four main groups from a historical and methodological point of view. The early studies regarding the ELGH used bivariate correlation coefficient between export growth and economic growth. Among these studies are Kravis (1970), and Michaely (1977); These studies generally concluded that there is strong evidence in favor of exportled growth hypothesis based on the fact that export growth and economic growth are highly correlated. The main weakness of this group of studies is the heavy reliance on the positive correlation between the two variables as evidence for supporting the ELGH.

⁴ African Economic Outlook, AfDB/OECD 2008

A second group of researchers studied the relationship between export and growth within a neoclassical accounting production function, including exports as an explanatory variable using ordinary least squares (OLS) on cross section data. Balassa (1978), Tyler (1981), Feder (1982), Kavoussi (1984), Ram (1987) and Moschos (1989) confirmed the existence of a positive effect of exports on economic growth for developing countries. This result has been obtained by estimations of an export augmented Cobb-Douglas production function with inputs including capital stock, labor and exports. Studies that do not support ELG include Kormendi and Meguire (1985), Sprout and Weaver (1993), Yaghmaian (1994). They justified the failure of ELG by some econometrics biases, different country sets, periods and variable definitions. A common feature of these studies is their reliance on cross section data sets. This group of models has been criticized for making a priori assumption that export growth causes output growth and for not considering the possibility of bi-directional causality between the two variables. Moreover, cross sectional analysis ignores the shifts in the relationship between variables overtime within a country, while export growth and economic growth is a long run phenomenon, which could not be studied using cross sectional analysis. In addition, the estimated relationship from a single equation neglects the simultaneity effect between exports and growth.

Such criticism has produced further studies of the relationship between exports and economic growth on time series data to determine the long-term relationship between export and economic growth and the direction of causality, if such relationship exists. A large number of empirical studies in this area (exports and growth relationship) have focused on the causal relationship between exports and economic growth. These studies began to employ Granger's (1969) and Sims (1972) causality tests to assess whether or not individual countries exhibit evidence for ELGH, their results are mixed. A number of studies that used Granger or Sims procedures to investigate causality did not provide conclusive support for the export-growth relationship, whilst the others found relatively robust evidence, which support the linkage. Jung and Marshall (1985) analyzed the relationship between export growth and economic growth using time series data for 37 developing countries. Based on the standard Granger causality tests, the study found evidence for the export-led growth hypothesis in only four of the 37 countries included in the sample: Indonesia, Egypt, Costa Rica, and Ecuador.

Chow (1987) applied causality tests on time series data of 8 newly industrialized countries (NIC, s) to investigate the causal pattern between export and growth in manufactured output. The study found evidence of bi-directional causality in the case of Brazil, Hong Kong, Israel, Korea, Singapore, and Taiwan; and no causality in the case of Argentina. Dodaro (1993) found evidence for unidirectional causality from economic growth to exports in the case of Egypt and bidirectional causality in the case of Israel but in seven out of a sample of 87 economies reveal a positive causality from exports to growth. However, he did not find any evidence of causality between growth and exports in the cases of Algeria, Jordan, Morocco, Sudan or Tunisia. Reizman et al. (1996) found support for ELG when using bivariate SGC test in the cases of Algeria, Egypt, and Tunisia but no evidence of causality in the cases of Israel, Jordan, or Turkey.

Most of the previous studies employed Granger-Sims causality test while no cointegration tests were been performed. The Granger or Sims tests are only valid if the

original time series are not cointegrated. As it is known, most of economic time series such as exports and output exhibit non-stationary tendencies that result in spurious regression results. To address the problem of cointigration and non-stationarity of variables, recent final group of studies on the export-led growth hypothesis has adopted the Error Correction Modeling (ECM) approach. In general, these studies have found empirical support for the export-led growth hypothesis for a majority of economies.

For instance, Bahmani-Oskooee and Alse (1993) re-examine the relationship between export growth and economic growth for nine developing countries within the framework of an Error Correction Model, and found strong support for the export-led growth hypothesis for all the countries included in the sample. Xu (1996) explored support for export-led growth in 17 out of 32 developing countries included in his study. On the other hand, Xu (1996) rejects the export-led growth hypothesis for India for the period 1960-1990. Ekanayake (1999) tested the ELG hypothesis for eight Asian developing countries for different periods. He employed cointegration and errorcorrection modeling techniques to investigate whether ELG hypothesis holds for these countries. The evidence supports short run Granger causality running from economic growth to export in all cases except for Sri Lanka. Yet, the strong evidence for long run Granger causality running from export growth to economic growth in all cases also exists. El-Sakka et al (2000) found mixed results regarding the direction of causality in 16 Arab countries. Abou-Stait (2005) examines the export-led growth (ELG) paradigm for Egypt, using historical data from 1977; the results support the hypothesis that exports Granger cause GDP growth. The study of AKA (2008) is one of the most exciting studies that concern the relationships between exports and economic performance in Africa countries. The study tests this relationship by using Markov switching multivariate regime dependent causality analysis in western African countries. The results reveal that exportled growth (ELG) hypothesis is supported in Senegal, while the growth-driven exports (GDE) point of view is detected in Niger. In Burkina Faso, Côte d'Ivoire and Mali both hypotheses hold implying a virtuous circle of growth and exports.

Nushiwat (2008) examines the direction of causation between exports and economic growth using Granger's causality test on time-series data of six countries (Brazil, India, Indonesia, South Korea, Mexico and Thailand) during the period (1981-2005). The empirical results indicate that the direction of causality was inferred only in the cases of India and Thailand. Causality ran from output to growth in the first case and from exports to growth in the second case. The study emphasis that a certain level of development is needed for exports to be effective in influencing growth.

Acaravci A & Ozturk I (2010) analyze the relationship between export growth and economic growth in Turkey using quarterly data from 1989 to 2006 by employing Toda and Yamamoto procedure for testing for Granger non-causality in the augmented vector autoregressive (VAR) methodology. The empirical results support the export-led growth hypothesis for Turkey and that Granger causal flow is unidirectional from real exports to real GDP. Elbeydi, et al (2010) investigates the relationships between export and economic growth in Libya in both, short and long run during the period 1980 – 2007. The evidence suggests the strong support for long-run bidirectional causality between export and GDP. This fact means that promoting exports via export promotion policies will contribute to economic growth in Libya.

Generally, there are only a few studies dealing with the export-growth causality regarding manufactured export, particularly in Egypt. Tyler (1981) is one of the few

studies that examine the causal relationship between manufactured exports and economic growth. He investigates the relationship between export expansion and economic growth for 55 middle-income developing countries for the period 1960 to 1977 by using a bivariate model to test the correlation between GDP growth and other economic variables, including the manufactured export beside the total export. Tyler's results illustrate that a higher growth rate of export is associated with a higher growth rate of GDP. Further, he concluded that countries with the fastest economic growth also had the fastest manufactured exports growth.

One of the few existing contributions that directly studied the growth effect of disaggregated exports is the work done by Fosu (1990); he studied the effect of manufactured exports on growth for developing countries as compared to primary sector exports, and reached a conclusion that there is a differential positive impact by the manufacturing export sector. Greenaway et al. (1999) studies the growth effect of disaggregated exports. In this study, exports disaggregated into fuel, food, metals, other primary, machinery, textiles, and other manufactures. Their results asserted that the export variable still has a positive and statistically significant effect on economic growth. Once exports have divided into the above-mentioned categories, fuels, metals and textiles appear to be the most important drivers of economic growth. The authors point out that this result is expected due to the relative importance of the textile sector to developing countries and due to metals and fuels being inputs in industrialized countries. Abu-Oarn and Abu-Bader (2001) examine the export-led growth (ELG) hypothesis for nine Middle East and North Africa (MENA) countries in three-variable vector autoregressive and error correction models. When considering total exports, their results rejected the ELG hypothesis in almost all of the countries examined. However, when considering only manufactured exports the results reveal the presence of bidirectional causality for Morocco, Tunisia, and Turkey, and unidirectional causality from manufactured exports to growth only in the case of Israel. No causality has detected in the cases of Algeria, Egypt or Jordan. Hachicha (2003) provides a useful theoretical explanation for export composition for the Tunisian case over the period 1961-1995 through applying a simultaneous error correction model. The study constitutes a support for the export-led growth (ELG) hypothesis for aggregate export. Moreover, the results show that the presence of a positive and significant relationship between exports and economic growth driven by manufactured exports rather than food processing exports and international tourism.

Siliverstovs and Dierk (2005) tested the ELG hypothesis for Chile using the time series data for 1960 – 2001. They employed a simple framework uses Johansen cointegration technique to examine the productivity effects of manufactured and mining exports in the context of the export-led growth hypothesis. Their main finding was that the manufactured exports Granger causes output but not vice versa which supports the export-led growth hypothesis for Chile. At the same time, their results indicate bidirectional Granger causality between the non-export GDP and mining exports. Dunusinghe, P. (2009) investigates the effect of exports and export composition on the economic growth process in Sri Lanka. The regression analysis showed that the expansion of the exporting sector positively and significantly affects gross domestic product (GDP) growth. Further, it showed that manufacturing exporting sector has higher productivity level than the other sectors.

As noted above the direction of causality between exports and growth in Egypt has not been adequately investigated particularly in the papers addressed the issue of manufactured categories, so in this paper, we contribute to those studies by using an empirical methodology of the relationship between exports of manufactured products and economic growth in Egypt over the period 1980-2008.

4. Methodology and Data

4.1. Methodological Issues

The paper attempts to investigate not only the existence of a long run relationship between economic growth and manufactured exports, but also exploring the short run causal relationship. For the examination of long-run relationship among theses variables, we use cointegration techniques, for the direction of causality; we use Error Correction Model (ECM) or/and Granger causality methodology. To test whether exports Granger cause the economic growth, this paper applies the causality test developed by Granger (1969). Four patterns of causality are distinguished: (a) unidirectional causality from X to Y; (b) unidirectional causality from Y to X; (c) feedback or bi-directional causality; and (d) no causality. More specifically, tests for Granger causality are based on the following VAR model:

$$Yt = b0 + a0Xt + \sum mj - 1 \ ajXt - j + \sum ni - 1 \ biYt - i + ut$$
(1)

 $Xt = c0 + d0Yt + \sum mj - 1 djYt - j + \sum ni - 1 ciXt - I + vt$

Where *Yt* denotes log of real GDP and *Xt* denotes the log of manufactured exports (aggregate level and each category). *ut* and *vt* are mutually uncorrelated white noise series. The null hypothesis to be tested are aj=dj=0, which means that exports do not Granger cause GDP and GDP also does not Granger cause exports for all j (j=0,1...m).

If none of the hypothesis is rejected, it means that exports do not Granger cause GDP and GDP does not Granger cause exports. If the first hypothesis is rejected, it shows that exports Granger causes GDP. Rejection of the second hypothesis means that the causality runs from GDP to exports. If all hypotheses are rejected, there is bi-directional causality between exports and GDP.

Before conducting the causality test, we need to ensure that variables series are stationary and hence are cointegrated together. In the case of stationary variables, the model should be estimated in level and a standard Granger causality would be applied. If all the variables are non-stationary in levels and are stationary in first differences, then a cointegration test is carried out to determine if a long-term relationship exists. Once cointegration is detected, causality tests have to be performed using an error correction model. If no cointegration is found, then the model has to be estimated in first differences and the standard Granger causality test is applied. We have performed unit root test using the augmented Dickey-Fuller test (ADF). This test is based on the estimate of the following regression:⁵

$$\Delta x_{t} = \alpha_{0} + \alpha_{1} x_{t-1} + \alpha_{2} t + \sum_{i=1}^{p} y_{j} x_{t-j} + \Delta x_{t-j} + \varepsilon_{t}$$
(3)

⁵ Phillips and Perron (1998) provide an alternative test for the unit roots that is robust to a wide variety of stochastic processes for the disturbance term.

Equation (3) is a random walk with intercept and time trend, where $\Delta x_{t=} x_t - x_{t-1}$, and x is the variable under consideration (log of GDP or log of manufactured exports), Δx is the first difference of x series, Δ is the first difference operator, p is the number of lags in the dependent variable. α_0 is the constant term, t is the linear time trend and ε_1 is the stochastic error term. In the context of the ADF test, the null hypothesis means a test for nonstationary of the series x, ($\alpha_1 = 0$). The alternative hypothesis for stationary requires that significantly $\alpha_1 < 0$. If the absolute value of the calculated t-statistics for x exceeds the absolute critical value, then the null hypothesis that the level of the series is not stationary must be rejected against its alternative. In this case, our variable is stationary. If the calculated t-statistics x is less than the critical value (in absolute terms), the null hypothesis of unit root cannot be rejected. It implies that the time series is non-stationary at the level and therefore it requires taking first or higher order difference of the level data to establish stationarity.

If the first difference is stationary (does not possess a unit root), the variable is said to be integrated of order 1, written I (1). However, if the variable is not stationary in the first difference, then we need to differ it twice to make it stationary. In this case the second difference is stationary, and the variable is said to be integrated of order 2, written I (2). The appropriate lag order in equation 3 is chosen based on Akaike Information Criterion (AIC).

A set of variables is said to be cointegrated if a linear combination of their individual integrated series I(d) is stationary, even though each series may individually be non-stationary. Because nonstationary time series do not return to their long-run average values following a disturbance, it is important to convert them to stationary processes; otherwise, regressing one non-stationary process on another non-stationary process can generate spurious results.

The next step is to search for cointegration between X and Y (that are log of GDP and log of manufactured exports). In order that X and Y have any type of causality, they must be cointegrated. This precondition can be confirmed by using either the Engle-Granger two-step cointegration procedure or Johansen-Juselius rank-based cointegration test. Both of them are based on the null hypothesis of no cointegration. The Engle-Granger two-stage procedures involve two steps to search for cointegration among the variables. In the first step, nonstationary series (For example, GDP and manufactured exports) are estimated by using Ordinary Least Squares method. The cointegration regressions for two time series can be written as follows:

$$Y_{t} = \beta_{0} + \beta_{1} X_{t} + u_{t}$$

$$X_{t} = \alpha_{0} + \alpha_{1} Y_{t} + v_{t}$$
(4)
(5)

After the estimation, in the second step the unit root process is applied to test the stationarity of error processes (residual) of the cointegration regressions equations (4 and 5) to determine whether the estimated values of the residual terms (u_t) and (v_t) in previous step are stationary. If we reject the null hypothesis, then (Y_t) and (X_t) are cointegrated, and interrelated with each other in the long run.

Otherwise, it is understood that these series are not cointegrated, in other words, we conclude that time series do not share the same stochastic trend in the long- run. However, the Engle-Granger approach is criticized for several shortcomings. The

maximum likelihood approach of Johansen and Juselius (1990) treats all variables as potentially endogenous and thus avoids the problem of normalizing the cointegrating vector on one of the variables. Moreover, it allows the empirical determination of the number of cointegrating relations and produces maximum likelihood estimators of the parameters of these relations. Two test statistics are used to identify the number of cointegrating vectors; they are named trace test statistic and maximum eigenvalue test statistic. In both tests, the null hypothesis of non-cointegration is tested against the alternative that is the existence of cointegration.

According to the trace test, the null hypothesis is at most r distinct cointegrating vectors. The maximum likelihood ratio puts another way, the maximum eigenvalue statistic, for testing the null hypothesis of at most r cointegrating vectors against the alternative hypothesis of l + r cointegrating vectors.

If the series are found cointegrated by either Engle-Granger approach or Johansen-Juselius approach or both, there must exist an associated error correction mechanism including an error correction term (ECT) obtained from the relevant cointegration regressions. ECT is used for correcting disequilibrium and testing for long run and short run causality among cointegrated variables⁶

The error correction model that arisen from the long-run cointegration relationship are defined as in equations (6) and (7)as following;

(6)

 $\Delta Yt = \beta 0 + \sum \beta 1i \, \Delta Yt - i + \sum \beta 2i \, \Delta Xt - i + \beta 3ECt - 1 + \beta_4 \varepsilon \Box$

 $\Delta Xt = \alpha \ 0 + \ \sum \alpha \ 1i \ \Delta Xt - i + \sum \alpha 2i \ \Delta Yt - i + \alpha 3EC' t - 1 + \alpha 4\varepsilon 2$ (7)

where Δ denotes the first difference operator, *ECt-1*, *ECt-1* are error correction and $\varepsilon \square$ and $\varepsilon 2$ are random disturbance terms. The error-correction terms *ECt-1* and *ECt-1* (which are the stationary residual series of the cointegrating vector 4 and 5) measure deviations of the series from the long-run equilibrium relations. The coefficients, $\beta 3$ and $\alpha 3$ are expected to capture the speed of adjustments of variables (GDP and manufactured export or Y and X) towards long-run equilibrium.

While the coefficients of the lagged independent variable in the two equations describe the short-run causal (constitutes a short-run Granger causality test), the inclusion of error-correction terms in equations (6) and (7) introduces an additional channel through which Granger causality could be detected in the long run.

4.2. Data

To model the causality action between manufactured exports and economic growth, we consider a vector regression model containing GDP and manufactured exports. Further, we do not focus on total manufactured export per se, but we decompose it into its key export categories. The manufactured exports have grouped into four broad categories sub-sectoral commodities that are dominating the export structure of manufactured products for Egypt during the last three decades⁷

 $^{^{6}}$ In the absence of cointegration, two vector autoregression (VAR) in first-differences model are constructed for both X and Y as a dependent variable without including the error-correction terms, then the standard Granger causality test (SGC) is applied for the two model (corresponding with equation 1 and 2 in the paper).

⁷ All product groups in the paper are defined according to revision 3 of (SITC) system. Iron and steel: (section 67), Chemicals products (section 33), Textiles: (section 65). Clothing: (section 84) and food products (sections 01, 02, 04, 09, 12 and 05 excluding group 054)

The VAR model includes the values of the following variables for Egypt; Y; real gross domestic product (real GDP at 1990 prices) X; real exports of manufactured products XT; real exports of textiles and clothing XM; real basic and fabricated metal products XC; real exports of chemical products XF; real exports of food products

Annual data for the period 1980-2008 is used. All data is measured by their natural logarithms. Unit price index of exports is used to deflate the export value series. The series on GDP deflator and export price index are collected from the International Financial Statistics published by the International Monetary Funds (IMF). The series on exports values are taken from The UNCTAD Handbook of statistics. The values of GDP are collected from United Nation Statistics Division.

5. Empirical Results and Interpretations

Having confirmed, in the Annex, the existence of a cointegrating relationship between GDP and export components as well as total manufactured exports for Egypt, therefore, error-correction model is used to capture the long-run causality between them⁷

For the error correction models, equations (6) and (7) have been estimated for (LY, LX, LXT, LXM, LXC and LXF) including the error-correction terms (that are the lag of the estimated error term taken from the cointegration equations reported in table 3). The empirical results of the estimated error-correction models are presented in the following table; which reveals the estimated coefficients of the error correction term (long-run effects) and the lagged values of the independent series (short-run effects).

The VECM specification reveals two channels of causality, either in the short run through the joint tests of lagged-differences of the independent variables, the latter channel points to the long run causality through the statistically significant of the ECT. The results presented in the table 4 above provide evidence on long-run impact from manufacturing exports to GDP, as well as from GDP to manufacturing exports in four cases. These results are based on the statistical significance of t-values associated with the respective numerical coefficients of the error-correction terms.

Table 5, shows that the estimated coefficients of the error correction term (ECT) are significant at 1% level, (and at 5% for some cases), and with the appropriate (negative) sign except for XC there seems to be no evidence of long-run causality from LXC to LY (although there is a reserve long run causality from LY to LXC). The estimated value of the coefficient of the EC term shows that the system successfully corrects its previous period's disequilibrium towards the long-run equilibrium relation. The speed of adjustment is strong and moderate in some cases⁹

The short-run dynamics are captured by the individual coefficient of the differentiated terms. It is noted that while unidirectional causality from the exports of both basic and

⁹ As it is known, the first difference of the logarithm of any variable represents the rate of growth for this variable. Hence, our variables mention to the rate of growth of output and the rate of growth of aggregate manufactured exports (as well of key categories).

fabricated metal and chemical products is detected at 1% level, unidirectional causality running from total manufacturing exports to economic growth reveals marginal significant at 10 percent. However, the reverse is not significant, indicating the absence of any short-run causality running from economic growth to total manufactured export as well as its main components. Only chemical case, out of these four categories of manufactured exports, has the direction of causality from growth to exports. The coefficient of the lagged value of Xc in Δ LY equation is significant at the 5% level of significance. This result indicates bi-directional causality between the exports of chemical products and growth in the short run, while in the long run this industry (chemical) supports the growth-driven exports and not vice versa.

			Short run causality		Long run causality
Causality	Dependent	Casual	Σ β1 ΔY(-	$\sum \beta 2i \Delta X(-$	β3ECt-1
direction	variable	variable	2)	2)	
(LY, LX)					
$\Delta LX \Rightarrow \Delta LY$	Δ LY	ΔLX		0.42	-0.47
			0.16	(1.8)***	(-4.1/)*
$\Delta LY \Rightarrow \Delta LX$	Δ LX	ΔLY	0.16		-1.11
			(0.78)		(-4.20)*
(LY, LXI)				0.002	0.02
$\Delta LXT \Rightarrow \Delta LY$	ΔLY	ALXT		0.002	-0.03
			0.55	(0.28)	(-3.1)*
$\Delta LY \Rightarrow \Delta LXT$	ΔLXT	ΔLY	(0.65)		-0.68 (-3-3)*
(LY, LXM)			(0.27)		(5.5)
$\Delta LXM \Rightarrow \Delta$	Δ LY	ΔLXI		3.96	-0.31
LY				(2.88)*	(-1.9)**
$\Delta LY \Rightarrow \Delta$	Δ LXI	ΔLY	1.2		-0.20
LXM			(0.33)		(-1.9)**
(LY, LXC)					
$\Delta LXC \Rightarrow \Delta LY$	Δ LY	ΔLXC		0.44	-0.14
				(2.91)*	(-0.80)
$\Delta LY \Rightarrow \Delta LXC$	Δ LXC	ΔLY	-0.15		-0.37
			(-2.09)**		(-2.19)**
(LY, LXF)					
$\Delta LXF \Rightarrow \Delta LY$	Δ LY	ΔLXF		0.35	-0.66
				(2.5)	(-3.25)*
$\Delta LY \Rightarrow \Delta LXF$	ΔLXF	ΔLY	-1.43		-0.64
			(0.47)		(-2.5)**

 Table 5 Causality Results Based on Error Correction Models

The optimal lag lengths of dependent and causal variables are determined at 2 in each equation according to Akaike's information criteria. Figures presented in each column are the estimated coefficient; values in parentheses are t-statistics *Denotes for 1% significant level ***Denotes for 5% significant level *** Denotes for 10% significant level

The previous results provide some support in favor of the argument that total manufactured exports are important as engine for growth, therefore, in turn, the economic

growth reinforces manufactured exports in the long run, suggesting the validity of longrun equilibrium relationship between economic growth and manufacturing exports in Egypt. Furthermore, the bi-directional causality between exports and economic growth in Egypt is a prevailing pattern not just in overall level, but at the sub-sectoral level as well.

With regard to the short run, it is widely notable that only chemical, & petroleum processing products and metal products drive the causality from their exports to growth. The textile, garment products and food products have not proved unidirectional causality from their export to growth in the short run, although this causality is found to be bidirectional in the long run. Furthermore, the results do not support the growth-led exports hypothesis in the short run for total manufactured exports and for the key categories as well, except for chemical and petroleum processing exports.

Overall, disparities between long run and short run causality based on aggregate and sub-sectoral results might be ambiguous, so these results should be interpreted in the context of some Egyptian facts about its manufacturing structure;

The textile and garment industries in Egypt contain very low value-added; they also use simple and labor-intensive technology. Furthermore, the majority of workers in these industries are unskilled. In turn, the export of this industry does not create sufficient stimulation to the country's industrialization process in the short run. Additionally, textile production tends to have very few backward linkages, which means only marginal contribution of this exporting sector to growth in the short run. Furthermore, U.S.A and EU quotas created a world market in which smaller, less-competitive textile and apparel exporters, such as those in Egypt, could count on stable export earnings.

Under these quotes Egypt's domestic textile and apparel industries was not exposure for a long time to global competitive market, hence, the incentive or willing to implement strategies promoting the competitiveness of this sector was marginal, or even was neglected. The picture may change in the long run, the competitiveness of the exporting firms in Egypt has likely increased and the capacity utilization may improve. Therefore, exporting firms could face higher degree of competition, which in turn, contribute significantly to enhance the long run growth¹⁰

Further, as textile and garment firms tend to be small and low technology users, the success is limited by the fact that the potential cost advantages of exporting goods in which technology is labor intensive would offset by the increases in capital and technology intensity methods. If this is the case, in the long run, economic growth could enlarge the size of current market, and hence creating new opportunities for textile and garments firms to flourish. The firms in turn, could be enabling to use more technological intensive methods, and hence they shift to relatively high value-added products.

Fabricated metal products are more skilled and capital intensive than textile products. This export might offer greater potential for knowledge spillovers and be more positive. It might boost the productivity of output in both short run and long run.

¹⁰ After the removal of U.S. and EU textile and apparel quotas, Egypt could lose the benefit of liberal quota access to U.S. and EU markets, but in the long run, industry will face new challenges. Governments and producers willing to implement aggressive strategies to confront the new global trade environment will likely prosper. Success will be ensured by industry that innovates and faces the risk of competition. (see; Changing International Trade Rules for Textiles and Apparel Egyptian Market Access, U.S. Agency for International Development. Final Report (2004).

In the short run, the economic growth has a weak impact on the export path of the fabricated steel (or metallic) in Egypt. Many autonomies factors-rather than growth may stand beyond the upwards trend in the exports of these products. Such as substantially higher prices in the domestic market or construction boom, competitiveness might be improved by the pound's depreciation and U.S. and EU restrictions on other steel imports pushed up the profitability of steel producers in the short run, and therefore, there will be a higher growth in that exports. If the recovery continues during the short run, the productivity gains in that export sector may allow the country to improve its income, thereby improving the output level via the multiplier effect of exports. Further, in the long run, circular causality between the growth of output and the exports of this sector exists. The exports of fabricated metal products stimulate the growth of economy through access to the wide world market, and hence the economies of scale are widespread. The latter enables the industry to build up their operations and get their products certified and more competitive by providing large market and more returns and foreign exchange for the imports of materials and components. Moreover, exports to the EU and USA confirm that the production of that industry would meet certificate and gualitative conditions.

Therefore, there have been sustained and favorable results arising from the fabricated metal exports in Egypt, which were accompanied by desirable export dynamics resulting from this industry during the short and long run periods.

Bidirectional causation from exports to growth is found for the exports of chemical products in the short run, while in the long run, the growth-driven exports is prevailing. Chemical sector in Egypt suffers from low efficiency, low-technology intensive, and it relates heavily to the oil price shocks. In the absence of offsetting improvements in productivity, the expected gains of dynamic effects from export expansion are likely to be very limited in that industry. Nevertheless, in the period of high growth, the firms have more money to invest. This investment will help to transfer the technology to the industry, to create more value added products in the long run, and to make it more competitive. During the short run, peaks and slumps in real GDP are correlated with peaks and slumps in real exports of chemical products. Higher growth in the short run, particularly which is correlated with the rising in oil price will lead to windfall gains in export revenues and hence relatively large increase in production, and therefore growth in GDP. It is likely that this exporting sector has contributed to a certain extent of economic growth only in the short run, but it has failed to impart a dynamic growth in other sectors in Egypt. So, when a boom in exports revenues ends, the windfall gains will tend to reduce sharply the competitiveness of export industry. Technological advances, especially in petroleum and chemicals have positive effects on improving their efficiency, which will result in a significant and sustained level in growth.

In the short run, trade shocks and associated macroeconomic fluctuations may constrain income growth accrued from industry of food processing, specifically that most of food products depend on crops and commodities and are affected by price volatility. Additionally, the major constraints to Egypt's food export competitiveness are the lack of proper post–agriculture facilities, market needs and requirements, as well as market information and quality standards systems.

Moreover, in short run it is not sufficient to create improvements in productivity of that sector, which makes us skeptical about the contribution of this sector in generating economic growth in short run. While, it is unlikely for the food products exports sector to experience high economic growth during a short run, it is not the case in the long run. Food processing industry is widely recognized as a reviving industry having huge potential for uplifting agricultural economy, exposing traditional Egyptian agriculture to modern technologies and to larger foreign market may create large scale. With high potential in export market, the food-processing sector can contribute significantly to enhanced incomes and employment generation by encouraging value added exports of food production. Such an increase in food products exports would tend to generate an upwards trend in GDP in the long run.

Furthermore, backward linkages to domestic suppliers and inputs are very high for food products, so the food processing export sector has the potential (eventually) to create demand for locally produced intermediate inputs, allowing spreading effective linkages, and therefore can provide higher economic growth in the end. Further, continued expansion of food products exports depends on the ability of Egypt to achieve sustained increases in growth, to pay for imports and to bring more technology and better access to productivity-enhancing the exporting capacity of food processing sector, which in turn could amplify the benefits accruing of rising export to growth in the long run.

Moreover, regional coordination arrangements currently negotiated or implemented between Egypt and EU (which is the most advanced in imposing healthy and environmental standards and conformity assessment procedures) will undoubted in the long run motivate Egypt to upgrade its food sector to achieve greater returns in terms of market access and to better meet international health and environment objective. The country can therefore gain greater growth in the long run.

Overall, robust long run bidirectional causality exists between manufacturing exports and GDP growth for the most major industries (as defined according to this paper) in Egypt during 1980-2008. Contrary, the composition of Egypt exports, which is more concentration towards primary commodities and labor-intensive products, constrains the contribution of aggregate exports to the growth in the short run. Further, despite, the positive contribution of petroleum and its products to the growth in the short rum, this contribution is not expected to be sustainable in the long run unless the gains in export revenues are invested in productivity improvements in that industry.

More precisely, ensuring a prosperous economy will definitely improve the quality, value added, export competitiveness and consequently ensuring the long run path of Egypt's economic growth in the long run.

5. Conclusions and Policy Implications

During recent years, there has been greater focus on the critical role of manufactured exports as a vehicle to accelerate economic growth. Most economists have asserted that export growth associates with higher growth. In addition, there is a potential for reverse causality, i.e. GDP growth enhances exports. These issues are still debatable.

Against this backdrop, the main objective in this paper is to determine if exportled growth (ELG) hypothesis is valid for the manufactured sector in Egypt. The manufactured exports play a vital role in Egyptian economy. This sector witnessed recent progress and going to become healthier thanks to several encouragement policies addressed in recent years. The major exports for Egypt are the products of petroleum and chemical, textiles & garment, fabricated metal and processed food.

This paper investigates the manufactured export-led growth hypothesis (MELGH) in Egypt using annual time series data for the period 1980-2008. Different

econometrics techniques are employed. These techniques are carried not only for total manufactured, but also for the sub-sectoral commodity exports, which are dominating the total structure of manufactured exports. Taking into account the stationary properties of the time series data, ADF and PP tests confirmed that all the series under consideration are non-stationary processes and integrated of order one. Furthermore, both Engle-Granger and Johansen approaches were used to investigate the cointegration. A long-run relationship between these series was found by applying the two methods. Following the detection of the cointegrating relationship, an error correction model was set up to investigate short and long run causality. The error-correction modeling technique reveals that there is a long run bi-directional causality between export and economic growth not just for aggregate manufactured products, but at the sub-sectoral level as well (textiles and textile products, basic metals and fabricated products, food-processing products). Only for chemical and petroleum products, no evidence of bi-directional causality from exports to growth is found in the long run.

Furthermore, the evidences affirm the short run unidirectional causality from exports of basic and fabricated metal, while bi-direction causality between chemical products and economic growth is explored. The unidirectional causality from total manufacturing exports to economic growth is only marginally significant at 10% level of significance in the short run. This reflect the dominating of natural resource-intensive or labor-intensive products in the export structure for Egypt, which hence could be the reason for the weak relationship flowing from total manufacturing exports to economic growth.. For the two remaining cases (food products, textile and clothing products), any short run causality is not explored.

This paper also proves that while there is a strong evidence for long-run causality from economic growth to exports in all cases of sub-sector industries, there is no evidence of such causality trend (from growth to export) in the short run. There are some institutional and market obstacles that contribute to slow growth and move resources out of inefficient uses that further cannot succeed in upgrading the manufacture export during this short time. It is widely notable from the results, that for only chemical exports the bidirection causality with growth is held implying a virtuous circle of growth and exports in the short run.

In this context, a remarkable circular or feedback causality is found between the total manufactured exports and economic growth in the long run, as well for the exports of some subsectoral manufactured products. Therefore, we can conclude that in the long run, no trade-off between whether to pursue a growth strategy of structural reforms for internal competitiveness, and afterwards increasing exports, or to spur economic growth by improving international competitiveness and internal efficiency of the export sector. Hence, policy makers should focus on promoting manufactured exports to capitalize on the beneficial impact of such policies on economic growth. The dynamism affecting the export sector also has an impact on the rest of the real economy. The latter takes advantage of the spillover effects of the exporting sectors thus causing a feedback effect on exports themselves.

The factor that is more important when adopting export-growth strategy in Egypt is the structure of manufactured exports. Unfortunately, the current structure suffers from some bottlenecks that hinder its contribution to growth. The empirical results reveals that the potential exporting of chemical and petroleum products in Egypt could not push the economic growth beyond the short run. This result implies that Egypt have to improve its investment climate for both domestic and foreign investors in order to generate growth and improving the potential of chemical exports to boost economic growth in the long run. The results also are showing that exports of fabricated metal products have a considerable impact on the growth in long-term perspective. Additionally, during the short run we observe a favorable effect from the export of this industry related to output growth. This result indicates that fabricated metal products manufacture in Egypt, especially from last two decade consider among important groups of the manufactured exports capable to generate an export-led growth boom during short and long run. On the other hand, the textile and apparel sector in Egypt has suffered from some internal and external policies. Under long years of U.S. and EU quotas, no incentives for the industries of textile and clothing to reinvest in new capital equipment, to improve the efficiency, or to build and maintain infrastructure which minimize the encouragements effect of this exporting sector to the growth process in the short run.

As indicated within the paper, the agriculture and food sector in Egypt characterized by some features weaken the ability of this sector to drive the growth in the short run. This sector exposes the country exports to the fluctuations prices in the international market. Moreover, this sector is hampered by a series of requirements and regulations. This therefore poses special obstacles for this sector to be competitive in local and international markets, and thereby the hypothesis that exports drive economic growth in the short run is assumed negligible in the case of the exports of processing food.

Given the preceding discussion, some caveats on export strategy should be taken. It is a mistake to make export competitiveness as a priority in enhancing Egypt's growth performance, it is not necessary exclusively or mainly for national growth, it is just a part of a global positive sum gain.

To emphasize that Egypt has begun to improve its exporting performance through diversification; it is an overstatement. The country needs massive efforts to change its current composition of exports during the short run. This implies that the success of Egypt's export in spurring the growth is conditional on boosting the efficiency of the industry where the country has a comparative advantage. There was international evidence that the current labor and land intensive industries in Egypt were relatively successful both in entering the export market and in the percentage of their output exported.

From this perspective Egypt will benefit more if it implements an export strategy focuses on developing the export structure with which it enjoys the greatest comparative advantage. These adjustment strategies will enable the industries to do better trends in the growth process during the short and long run. After reaping the rapid and sustainable growth in the long run, the emphasis has to shift to relatively higher value-added products. Hence, diversification would become appropriate strategy for keeping rapid growth. At this sense, greater diversification in exports would contribute positively to growth in both total exports and output. Hence, accelerated growth would enable the industrial exporting firms to use more technology methods and to become more efficient than is the case at present. It is therefore true to suggest that continuous export expansion is decidedly not the answer for future sustainable growth. What may really matter is upgrading the current traditional exports structure.

In all,, exports of manufactures is doubtless an encouragement tool to increase growth, but this sector in Egypt is not by enough to generate a sustainable and stable growth similar to those of other Asian and dynamic emerging economies. The fact remains that the efficiency under which exporting firms operate is an important element in their ability to do better results for growth. If this is so, then the healthy environment for sustainable growth is necessary to enable the country in creating a robust manufactured export base.

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Annex on line at the journal Website: http://www.usc.es/economet/aeid.htm

Annex



Figure 1: The evolution of current GDP in Egypt in mill \$ during the sub-periods 1980-2008

Figure 2: The evolution of current GDP and manufactured exports in Egypt in bill \$ during the sub-periods 1980-2008



Figure 3: The evolution of current merchandise exports in Egypt in mill \$ during the sub-periods 1980-2008





Figure 4: The evolution of key manufactured exports in Egypt in bill \$ during the sub-periods 1980-2008

Cointegration

As a precondition of the employed methodologies (testing for cointegration), stationary of the series is examined. The Augmented Dickey-Fuller test (ADF) and the Phillips-Perron test (PP) are carried out on each of the time series for the variables under investigation to determine the order of integration of these series. We employed the two tests with and without a deterministic trend. The tests are performed on both the levels and first differences of the manufacturing exports indices and GDP series. Table 2 presents the results of unit root tests.

The ADF test confirms the presence of unit roots in all six variables (LY, LX, LXT, LXM, LXC and LXF). The PP test shows the existence of unit roots, and therefore nonstationarity in the levels of all variables except for the variable LY (with trend), although it is nonstationary without trend. More specifically, the null hypothesis about non-stationary cannot be rejected at the levels of all variables under ADF test.

While the tests of unit roots support the nonstationarity for all data series, when the first differences of the variables are considered, the null hypothesis is rejected in favor of alternative hypothesis, which states that the series are stationary. Although the PP unitroot test reveals nonstationarity for LY in its first difference with trend, interestingly, the first difference of this variable shows stationarity in the case of no trend.

	Table2 ADT and 11 unit root tests											
Varia	A	DF test		ADF test statistics		PP test statistics		PP test statistics				
bles	statis	tics level	ls	first differences		levels			first differences			
	C &	с	L	C & T	с	L	C & T	с	L	C & T	с	L
	Т											
L (Y)	-	-1.04	1	-	-5.077*	1	-	-	3	-2.491	-	3
	2.262			4.037**			5.784*	2.361			2.660***	
L(X)	-3.01	-3.22	1	-9.299*	-5.545*	1	-4.17	-4.05	3	-9.506*	-5.426*	3
L	-	-	1	-3.130	-	1	-1.943	-	3	-	-4.010*	3
(XT)	1.926	1.126			3.210**			1.349		3.923**		
L	-	-	1	-	-4.459*	1	-1.616	-	2	-	-4.684*	2
(XM)	1.083	0.326		4.654**				0.497		4.610**		
L	-	-	1	-5.406*	-4.033*	1	-1.920	-	2	-5.968*	-4.827*	2
(XC)	2.596	1.313						0.889				
L	-	-	1	-5.190*	-4.689*	1	-1.560	-	3	-8.020*	-6.886*	3
(XF)	1.584	0.484						2.327				

Table2 ADF and PP unit root tests

*, ** and *** indicate significant 1%, 5% and 10% levels respectively comparing critical t statistics as computed by MacKinnon (1991). 1%, 5% and 10% critical values for ADF statistic (without trend) are -3.707, -2.979,-2.629 respectively, while for PP statistics are; - 3.696, -2.975, -2.626 respectively. 1%, 5% and 10% critical values for ADF statistic (with trend) are -4.355, -3.594, -3.232 respectively and for PP statistics are -4.355, -3.594, -3.231 respectively. 1%, 5% and 10% critical values for ADF statistics (variables in first dif.) =-3.96, -3.018 and -2.682 (without trend) & -4.732, -3.761 and 6.322 (with trend). For PP statistics, the statistics values are -3.707, -2.979 and -2.626 (without trend) & -4.355, -3.594 and -3.232 (with trend). L denotes the appropriate lag lengths, which are chosen using Schwarz Information Criterion (SIC) for ADF, and based on Newey-West for PP. c = intercept and c & t = intercept and the time trend

In general, the ADF and PP tests support the unit root hypothesis in all data series, indicating that GDP and manufacturing exports (total and subsectoral) in Egypt are integrated of order one I(1), i.e., nonstationary in levels. On the other hand, the test results indicate that the first difference of GDP and of all the variables of manufacturing exports in Egypt is integrated of order zero, I(0).

Therefore, the cointegration test was performed by applying both Engle-Granger two-stage cointegration procedure and Johansen-Juselius cointegration test to check whether each pair of the two variables (Y and X; for each category) are cointegrated.

At first, Engle-Granger cointegration test procedure is applied involving testing the stationarity for the residuals of the cointegration equations for all the variables. In doing so, cointegrating equation (4) is estimated through OLS for LY, inclusive each category for X as an independent variable separately. While cointegrating equation (5) is estimated for each of LX, LXT, LXM, LXC and LXF respectively, then, the residuals of each estimated cointigration equations are obtained and the ADF test is applied to check whether the residuals from each regression is stationary, i.e., I(0). The results of cointegration tests and the estimates of the cointegrating parameters are reported in the table below:

Tublee Engle Of	anger connegration (est results	
Cointegration	Coefficient of	t value	Calculated
Equations	independent		ADF for Residuals
	variable		
LY = f(LX)	0.47	6.6	-2.11** (1)
LY = f(LXT)	0.65	7.5	-2.27**(1)
LY = F(LXM)	0.36	4.1	-2.03**(1)
LY = f(LXC)	0.60	11.3	-1.76***(1)
LY = f(LXF)	0.57	3.7	-2.53**(1)
LX = f(LY)	1.31	6.5	-3.42*(1)
LXT = f(LY)	1.04	7.5	-2.44**(1)
LXI=f(Y)	1.08	4.1	-3.11*(1)
LXC = f(LY)	1.37	11.3	-2.48**(1)
LXF = f(LY)	0.58	3.6	-2.52**(1)

Table3	Engle	Granger	cointegration	test result	S
1 40100	Lingie	orunger	comechiation	cost i couit	2

Figures within parentheses indicate lag lengths. The optimal lag length is determined by Schwarz critertion. *, ** and *** indicate significant at 1 per cent, 5 per cent and 10 per cent levels respectively comparing critical t statistics as computed by MacKinnon (1991). The ADF critical values at the 1 percent, 5 percent and 10 percent significance levels are -2.66, - 1.95 and -1.622 respectively (without trend & intercept).

The results indicate that the estimated ADF statistics for the residuals series are greater than their corresponding critical values at 5% level of significance, and in few cases at 1% or 10% level, which state that the residuals series of cointegrating equations are stationary, providing evidence for the existence of cointegration vector in all reported regressions⁸

As evidenced from the table above the signs of all coefficients for the cointegration equations are positive and significant. This indicates that economic growth and manufacturing exports (for each category separately) are positively related with each other. These results lead to the reasonable expectation that two ways stable long - run relationship exists between GDP and the manufacturing exports for all four components of X for the 1980 to 2008 period.

Although Engle and Granger Cointegration results imply the existence of meaningful long run equilibrium, the OLS estimators of the cointegrating vectors may contain a small sample bias leads to a spurious regression results. To overcome any confusion about the cointegration relation the Johansen-Juselius procedure is also applied for all the series. The test would be performed to a bivariate system that includes GDP series and each series for real manufacturing exports separately. Before running cointegration test, the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC) are used to determine the lag length for the VAR model.

⁸ PP unit root test is also applied for the residuals from countegration equations. The results affirm the stationarity of the residuals for all the cases. The results are not reported here, but are available with the author upon request.

Using Johansen's maximum-likelihood approach, Table 4 below, reports the maximum likelihood ratio (LR) statistic for testing the null hypothesis of at most r cointegrating vectors against the alternative hypothesis of r+1 cointegrating vectors.

Tuble Feolitiegi uton EK test bused on gonunsen 5 maximum internitood uppi ouen								
	Null	Alternative	Likelihood-	Number of	No. of			
	Hypothesis	Hypothesis	ratio	lags	cointegration			
			statistics	-				
LY and LX								
	r=0	r=1	27.19*	1	None**			
	r≤l	r=2	10.3	1	At most 1			
LY and LXT								
	r=0	r=1	35.8*	1	None*			
	r≤l	r=2	4.3	1	At most 1			
LY and LXM								
	r=0	r=1	36.6*	1	None*			
	r≤l	r=2	3.7	1	At most 1			
LY and LXC								
	r=0	r=1	30.6*	1	None*			
	r≤l	r=2	3.6	1	At most 1			
LY and LXF								
	r=0	r=1	35.3*	1	None*			
	r<1	r=2	7.3	1	At most 1			

Table4 Cointegration LR test based on Johansen's maximum-likelihood approach

All cointegrating equations include constant term. (*)** denotes rejection of the hypothesis at 1% (5%) significance level

As seen from the table above, LR test statistics show that the null hypothesis of no cointegration is rejected at 1% for most cases.

However, the null hypothesis of at most one cointegrating vector in favor of r = 2 cannot be rejected indicates one cointegrating equation. Thus, the empirical results imply a longrun association between GDP series and manufactured exports (and export components as well). The results of both Engle-Granger two-step procedure and Johansen-Juselius cointegration test confirm that the relationship between manufacture Exports and GDP follows a common equilibrium long-run path during 1980-2008. Additionally, a series of diagnostic tests are used to show that the underlying results are fulfilled. for all the cointegration equations; Histogram-Normality test, (LM-tests) of no serial correlation, Lagrange multiplier (LM) test for autoregressive conditional heteroskedasticity, (ARCH) and the Autoregressive Conditional heteroscedasticity (ARCH) test of test homoscedasticity were carried out. The results suggest that for most of the series the null hypotheses could not be rejected at 5% significant level, assuming that the residuals are normally distributed, homoskedasticity and serially uncorrelated. The null hypothesis of parameter stability could not be rejected for most equations at the 5% significant level. Further, the Ramsey Regression Equation Specification Error Test (RESET) is applied, if the null-hypothesis is rejected, then the model suffers from misspecification. By comparing F test statistics with the critical values, we are unable to reject the null hypothesis for all the equations and then the results suggest that the true specification is linear and the cointegration equations pass the Ramsey Reset test.