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Abstract: Economic development in Cuban economy in the last 50 years has been involved in the so called socialist revolution time. In the external sector, the COMECON arrangements have determined its international specialization trade pattern and balance of payments position until 1989. When the Berlin Wall fell down, Cuban economy collapsed showing the malfunctions of the previous external regulated period. In this paper, we analyzed the role of exports as an engine of economic growth in Cuba considering essential events in its commercial policy-making in the long period from 1960 to 2004. Our results show that the export led growth (ELG) hypothesis is not an appealing phenomenon. Causality proofs on the basis of error correction and augmented level VAR modellings show the imperious necesssity to import for the Cuban development. The inclusion of imports not only evidences the weakness in the feedback and interrelation between economic growth and exports but also their expansion has been precisely causing growth in most of the considered periods.

Keywords: Cuba, Export-led Growth, commercial agreements effects, cointegration, causality, error correction and augmented VAR modelling.

JEL Classification: C32, C52, F43

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I. Introduction.

Though since the ninetieth century connections between openness and growth have been an issue of interest, it is in the last thirty years when this traditional economic area of analysis has produced a great amount of works and a strong attention from the development international institutions. This reappearance coincides, on one hand, to the long time rapid growth achieved by the Asian newly industrialized countries (NICs) which have implemented since the seventies a (successful) outward oriented development strategy; on the other hand, the Latin American import substitution development strategy showed by the same time both their limits and their economic malfunction, especially when they are compared with economic growth dynamic of Asian countries.

Empirically, the causal relationship between exports and economic growth has been a primary topic of research in the openness growth issue and, till now, is an ongoing debate in the economic development literature. Exports have been considered the main channel through which openness increases the economic growth performance. The main question in the export-growth issue is whether causality goes from exports to economic growth, labelled Export-led Growth (ELG) hypothesis or, contrary, causality flows from economic growth to exports, namely Growth-led Exports (GLE) hypothesis. The establishment of the direction of this causal relationship has important implications for economic policy strategies. If causality flows from exports to growth then the implementation of export promotion policies is a proper strategy for a country to grow. But if causality goes on the reverse direction then a certain degree of development may be a prerequisite for a country to increase its exports and, therefore, previous internal economic growth policies are necessary to expand exports. A bi-directional causality would imply that both strategies are necessary as long as one reinforcing the other one. More recently, and complementing the connection between the external sector and growth, the role of capital flows, especially Foreign Direct Investment, has been also considered.

Among the set of developing countries, the Cuban economy is an appealing example due to *special* trade agreements periods in their unique economic growth and development path and political and social systems. In the external sector, the period running from 1960 to 1991 was overbear by the integration of Cuba in the Council of Economic Mutual Assistance (COMECON), formed by socialist countries. This period implied for Cuba the definition of all the relevant aspects of the external sector: its international commercial partners, the prices of exports and imports and what is even more important, the pattern of goods to be exported and imported The COMECON implied special financial facilities for trade flows and commercial preferences for the Cuban economy and moved away from the country external capital flows. In this long period, the external sector was in fact no open and import and export flows were no price market directed. After the rupture of the socialist block in 1989, Cuban output and exports suffered an intense crisis and begun a period of structural reforms searching for macroeconomic stability and a "new" international pattern into the world economy. This new guide of international integration has been based more intensely in the services, mainly associated to tourism exports, rather than in deep changes in the goods trade flows.

Hence, the main objective of this paper is to examine the evidence of the openness growth connection on the Cuban economy in very different periods of their economic international trade recent history and including for the first time the services together with goods, because of the great importance of tourism since the beginning of the nineties as we have already pointed out. Our major concern is to present a sequential causality analysis that in higher dimensional systems takes into account the indirect effect of terms of trade and imports of goods and services.

This article contributes to the economic development of Cuban economy in the following ways. Firstly, it tests the ELG hypothesis for Cuban economy through the application of recent advances in time series techniques including in the analysis the exports of services, basically tourism, in the ELG hypothesis which has not been analysed in previous works. Secondly, we seek to examine indirect effects on the ELG phenomenon through the inclusion of imports and terms of trade in the analysis. Thirdly, it provides new insights on the effects of the COMECON period in the causal relationship between exports and output in the recent economic history of Cuba and, therefore, to show future guidelines for external economic strategies related to development performance. In this sequential study, our starting point is to test for causality in a bivariate framework linking output and exports of goods and services on the basis of a vector error correction model (VECM). Then, we move to multivariate systems by considering the information provided by the terms of trade and, later on, by the imports of goods and services; in both higher-dimensional analysis Granger causality is implemented by means of the modified-Wald test (MWALD) for augmented level VAR model with integrated and cointegrated processes introduced by Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) (TYDL henceforth).

We should remark that in order to test for those indirect effects on the ELG hypothesis, the inclusion of imports of goods and services, is also taking into account capital accumulation , as long as capital goods have been basically imported in the Cuban economy as we are explaining below. In this sense, we use a demand approach of the economic growth dynamic but considering also the most important variable in the supply approaches of economic growth

The rest of the paper is organized as follows. Section 2 provides a survey of the literature on the export-led-growth thesis. In the third section data and a descriptive analysis is presented. Section 4 contains the econometric methodology and the models will be systematically introduced and discussed while Section 5 sets our empirical results for Cuba. The paper closes with a brief discussion of the results.

II. Export-Led Growth. A brief survey on the literature.

From a theoretical point of view and with regard to exports as a generator of economic growth several approaches can be distinguished (see, Krugman, 1987; McCombie and Thirlwall, 1994; Giles and Williams, 2000, for a survey). First, the rate of growth of exports, as a determinant of aggregate demand, affects directly to output growth; an increase in foreign demand can produce a rise in output due to greater employment, income an investment in the exportable sector. Of course, this direct connexion is related to the foreign trade multiplier exposed by Hicks (1950). Second, the increase of exports can indirectly raise output growth based on the assumption of increasing returns to scale and spill-over effects from exports to other sectors of the economy. These externalities can produce a more efficient resource allocation, moving resources from relatively inefficient non-tradable sectors to the higher productive export sector.

Besides, exports sectors can promote the diffusion of improved techniques, exploitation of economies of scale, learning by doing gains, greater capacity utilization and improved technological and management abilities due to more competitive markets faced by export sectors. New growth and international trade theories emphasised these indirect channels of benefits of a dynamic export sector to economic growth (for example Arrow, 1962; Lucas, 1988; Helpman and Krugman, 1985; Grossman and Helpman, 1991). Third, growth requires imports of capital and intermediate goods that allows a faster capital formation and, therefore, increasing rates of growth, and if exports do not rise as fast as import requirements, growth could be constrained by the balance of payments (as suggested, for instance, by Lamfalussy, 1963; Mckinnon, 1964 and Thirlwall, 1979). Forth, the smaller is the domestic market, the greater is the importance of the external demand to achieve economies of scale and to obtain capital and intermediate goods as was suggested by Adam Smith more than two centuries ago.

Though all these reasons support outward-oriented policies to achieve higher rates of growth, there are theoretical critics to the ELG hypothesis. For instance, the traditional import substitution strategies implemented by Latin American and other countries to foster domestic firms and sectors because of the hypothesis of deterioration of terms of trade exposed by Prebisch (1950, 1959) and Singer (1950). Grossman and Helpman (1991) showed that protection of key sectors in economies with comparative disadvantage may lead to higher economic growth. Technological approaches of international trade, based on absolute advantage (Smith, 1776), support this possibility of negative effects of openness in growth depending on the absolute advantage of tradable sectors (see, for instance, Dosi and Soete, 1998 and Krugman, 1996). There is also support for GLE hypothesis based on the assumption that economic growth leads to enhancement of abilities to produce, to use and develop new technologies, and so on, that increase productivity creating that comparative advantage necessary to export (Krugman, 1984). Finally, the role of imports as an engine for long-run economic and export expansion have been emphasized into the endogenous growth models (Coe and Helpman, 1995). Imports serve as a channel to get foreign R&D knowledge and more advance capital and intermediate goods suggesting Import-led Growth (ILG) alternative causality relationship (Awokuse, 2007).

Since trade theories does not provide a definitive answer on the causality between exports and growth, the debate has generated a vast amount of empirical work, especially applied to less developed countries. Results from these studies are, at best, mixed and contradictory (Ahmad and Kwan, 1991 and Bahmani Oskooee et al., 2005).

The majority of empirical studies can be separated in three groups (see Giles and Williams, 2000; Begum and Shamsuddin, 1998; Bahmani Oskooee et al., 2005 for more extensive reviews on the empirical literature). The first group includes studies based on cross-sectional data using correlation coefficients or ordinary least squares (OLS) regressions between exports and output. A huge number of countries and time periods can be found but in general those results tend to support a positive association between exports and output (for example, Kravis, 1970; Balassa, 1978 and Feder, 1982). A second group includes works using standard time series regression techniques such as ordinary least squares (for example, Ram, 1985 and Foster, 2006). However, these two first groups though they are analyzing possible relationships do not analyse the direction of causal influence from exports to growth or vice versa. Finally, the third group includes all those more recent studies that have used new time series methods to establish integrating properties of exports and output in order to analyze causality on the basis of either the cointegrating properties of their long-run relationship through the introduction of cointegration and error correction modelling by Engle and Granger (1987) or augmented VAR levels and acyclic graphs. These studies include cross-country and single country analysis of the ELG hypothesis and, independently, results are mixed (Islam, 1998; Bahmani Oskooee and Alse, 1993; Van den Berg and Schmidt, 1994; Richards, 2001, Balaguer and Cantavella-Jordá, 2004; Awokuse, 2005a, 2005b, Bahmani Oskooee et al., 2005 and Siliverstovs and Herzer, 2006).

In general, cross-country analysis have supported associations between exports and output but time series data studies have failed to provide strong evidence in favour of either ELG or GLE hypothesis. We note that cross sectional data studies show two essential problems: the first one is the important limitation of correlation analysis because exports are built into output and spurious results can be achieve because of the bias in favour of correlation (Sheehey, 1990). Trying to avoid this bias of correlation between exports and growth a new literature has emerged including additional variables and, then, moving to a multivariate correlation and causality (for instance, Sheehey, 1992; Tang, 2006; Kónya, 2006 and Awokuse, 2007). In these papers, indirect effects have been taking into account by including capital, productivity, foreing output, ratios of commodity or trading patern destination concentration, government budget deficit or an economic openess variable. The second problem is that this kind of studies assumes common and identical economic structure and levels of development to all the countries considered.

More recent studies are considering the connection between capital flows and growth because of the suppose positive effects of openness on growth involves much more than just trade. Those empirical contributions are generally addressing that FDI is appering to cause beneficial effects for domestic investment, technology transference and spillover effects on domestic labour and capital productivity. Meanwhile portfolio capital inflows and banking and commercial loans have not shown important impacts on economic growth (see Cuadros et. al (2004) and Goldin and Reinert (2005), for a survey).

As far as we know, there is no contribution including the case of Cuba in a cross country study dealing with the ELG hypothesis and, in a single country scenario, there are only two papers tying up exports and output: while Mendoza and Roberts (2000) use a least square methodology to test a balance of payments constrained model, Creibeiro and Triana (2005) analyses import and exports elasticities by using different techniques which include cointegration and error correction modelling. These two contributions support a positive association between exports of goods and output but neither services are included nor causality is examined.

III. Data and descriptive analysis

The database consists of annual time series covering the period 1960-2004 from Oficina Nacional de Estadística (ONE), Comité Estatal de Estadísticas (CEE), Instituto Nacional de Investigaciones Económicas (INIE) and Ministerio de Economía y Planificación. The variables considered in our modelling are real gross domestic product (GDP), exports of goods and services (X), imports of goods and services (M) and the terms of trade (TOT) which are defined by the ratio price index (1997=100) of imports and price index of exports. All the variables are expressed in logarithmic terms. As long as the beginning of the seventies and the nineties steer two exogenous cutt-off points in the Cuban policy-making, three different sub-periods- 1960-1989, 1970-1989 and 1990-2004- are also examined from now on.

Figure 1 depicts the evolution of real GDP, imports and exports in Cuba during 1960-2004 (table 1 shows their corresponding average annual rates of growth for the whole and selected periods). All variables followed upwards trends, but with different rhythm. The long term slope of GDP severely dropped after the collapse of communism system in East Europe in 1989 (real GDP dropped 35% between 1990 and 1993); in fact, it is in 2005 when the Cuban economy retrieved real GDP levels of 1989, implying fifteen years of stagnation in this period. During 1970-1989 the economy rate of growth was relatively high based on the COMECON arrangements which specified exports and imports goods, volumes and prices. After Berlin Wall fallen, Cuban economy enters in a stage of sector, institutional and openness reforms trying to face up the negative effects of soviet collapse; agrarian reform to increase output, tourism openness to foreign investment, biotechnology sector recommendations and exports financial support were policies implemented to improve economic performance in this difficult period (González, 1993). Since 1994, the economy recovered a positive path not only in its economic growth and but also in its export and import performance, but absolute levels in 2004 do not reach 1989 levels.

We note that exports have shown a more volatile path with a long period of rapid growth in 1970-1989, an intense dropped in the rate of growth from 1990 to 1995 and a quite fast recover of the slope of growth after 1995. 1972-1985 was the golden period of Cuban exports and imports: the annual rate of growth was of around 16% and 15%, respectively and economic growth reached almost 7% annual rate of growth. In this period, Cuban economy was integrated in the COMECON with preferential prices for Cuban most important exported products, especial access to soviet markets and other facilities such as import credits and others. From 1960 until 1989 more than around 80% of exports were sugar, nickel, fish products, citrus fruits and tobacco and COMECON countries received almost three quarters of the global Cuban exports. Later on, after the disintegration in 1991 of socialist area and Soviet Union and subsequently the end of the COMECON commercial agreements, Cuban exports had to be diversify in terms of exports products and commercial partners: medicaments and tourism were the principal exports hereafter and Canada and Latin America the regions of destination.

Table 1. Cuba: GDP, exports and imports (1960-2004 and selected periods)

Period	$\dot{gdp}$ (1)	$\dot{x}$ (1)	$\dot{m}$ (1)	$\dot{tot}$ (1)
1960-2004	3.03	4.87	5.00	0.26
1960-1989	4.91	7.71	9.14	-0.81
1970-1989	5.47	8.53	9.74	-0.82
1972-1985	6.93	16.13	15.20	-1.5
1990-2004	-0,.1	-0.38	-2.24	2.83
1994-2004	3.52	8.27	8.93	-0.5

Notes: (1) Denotes average annual rates of growth of real GDP, exports and imports, respectively.

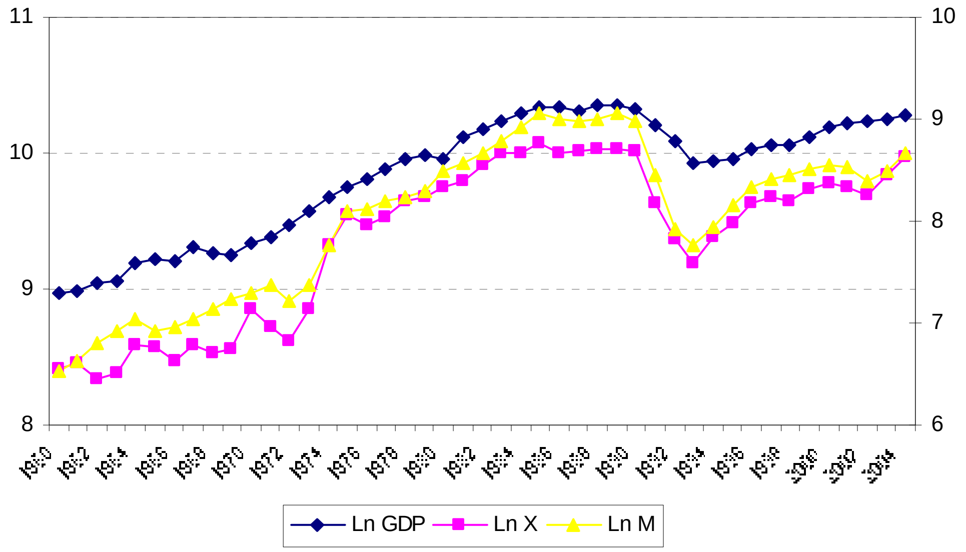
Source: Own calculations based on data from CEE and ONE

Also imports followed a rapid rate of growth during the COMECON period, a collapse in the first years of the nineties and a slow recuperation after 1994. During the COMECON period just about the 90% of imports were composed by capital and intermediate goods: one third of them capital goods were necessary for industrialization process of the Cuban economy and petrol was the most important intermediate goods for production arriving from the Soviet block. After 1989, imports pattern was diversified in terms of products. Capital goods and fuel imports were substantially reduced due to the economic crises and consumption imports were elevated in order to complete the basic food basket of Cuban population, attaining more than 20% of imports during these years. On the other hand, traditional East commercial partners began to be substituted for Latin America, Asian and European countries.

Finally, terms of trade have shown a slightly improvement during COMECON period, coinciding with those faster periods of exports and imports expansion[1]. Hereafter, the collapse of the Soviet Union implied a continuous deterioration of terms of trade moving away from administer prices of the previous rules and adjusting Cuban external sector prices to more realistic international market conditions.

We note that the Cuban economy have shown some special features on their openness growth nexus in the long period of time we are analyzing in this paper. Firstly, Cuban international trade pattern of specialization is perfectly defined by exports that are, basically, primary goods and recently tourism and imports are representing the capital and technological goods in the economy of the Isle. Secondly, no important flows of FDI have arrived to the Cuban economy in the COMECON period and after that, these flows have been mainly related to tourism services. For it, our econometric modellings have tested the ELG hypothesis through a direct bivariate analysis and then we considered the indirect effects by considering in multivariate structures the terms of trade and imports, as long as they are the most important indirect links in the openness growth connection, representing the principal via of accumulation of capital for Cuba.

Figure 1. Cuba 1960-2004: real GDP (left scale), exports and imports of goods and services (right scale). Source: CEE and ONE.



As Figure 1 is suggesting there exists a closer association among exports, imports and output showing upward trends in the same periods and an evident and deep break in their long run expansion in the end of the eighties. Our task needs to econometrically validate such connexion and what is most important in our work to test for causal influence among trade and economic growth. In looking for the ELG or GLE hypothesis, we investigate the possibility of Granger causality between the export expansion and economic growth pace by means of a sequential procedure. Though the classical bivariate structure linking exports and income is analyzed by considering their long-run association and therefore an error correction model, our study is extended to higher dimensional systems. In so doing, we are concerned with the Granger casual inference biases that can emerge when cointegration must be pre-tested so looking for a genuine and complete model and on the basis of the advantages of the TYDL procedure, the effect of terms of trade and imports are introduced and tested in the causal relationship.

IV. Model specification. Causality and Methodology.

Granger (1969) introduced a popular causality concept which has been used in the context of rational expectations, definition of super exogeneity and econometric modelling strategy. He defines a variable x_t to be casual for a time series variable y_t if including the former variable in the information set helps to improve the forecasts of the latter. More precisely, let Ω_t stand for the set of all the relevant information in the universe and $y_{t+h|\Omega_t}$ for the optimal *h*-step forecast of y_t at origin *t* based on Ω_t. We may define x_t to be Granger-non causal of y_t if and only if

$$y_{t+h|\Omega_t} = y_{t+h|\Omega \propto \{x_s | s \leq t\}}, \qquad h = 1,2,\ldots \qquad (1)$$

Where the symbol $A \propto B$ denotes the set of all elements of a set *A* not contained in the set *B* and *h* is a positive integer that can be infinite. Hence, x_t is said to be not causal for y_t if removing the past of x_t from the information set does not change the likelihood to help predict y_t at any forecast horizon. In turn, x_t is Granger-causal for y_t if (1) does not hold for at least one *h*, and thus a better forecast of y_t is obtained for some period ahead by including the past of x_t in the information set.

The simplest and most common framework assumes that Ω_t only contains past values of x_t and y_t, that is, $\Omega_t = \{(y_s, x_s)' | s \leq t\}$ and $(y_s, x_s)'$ is generated by a bivariate *p*th-order VAR process given by

$$\begin{bmatrix} y_t \\ x_t \end{bmatrix} = \sum_{i=1}^{p} \begin{bmatrix} \alpha_{11,i} & \alpha_{12,i} \\ \alpha_{21,i} & \alpha_{22,i} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ x_{t-i} \end{bmatrix} + \varepsilon_t \qquad (2)$$

and non-causality condition (1) of x_t for y_t is equivalent to test if the lags of the first variable do not enter in the first equation[2], that is,

$$H_o : \alpha_{12,i} = 0, i = 1,2,\ldots, p \qquad (3)$$

Granger causality is dealing with precedence and, precisely, the procedure defined by (3) which tests the significance of the coefficient of the lagged independent variable is commonly used in practice though many other testing procedures have been proposed in the related literature

In this paper we consider two popular approaches to Granger causality: (*i*) the bivariante and simplest case is investigated in the framework of the vector error correction model (VECM); and (*ii*) the Wald test on augmented levels VAR procedure is used in the higher dimensional systems.

In this scenario, our study seeks to examine the possibility of a causal relationship between Cuba's external position and its growth path. Having analyzed the stationary properties of the involved time series data in order to avoid the error of spurious results, our starting point, therefore, is the following bivariate model error correction model linking GDP and exports long-run information with a short-run adjustment mechanism

$$\Delta \ln GDP_t = a + \lambda \hat{e}_{t-1} + \sum_{i=1}^{M} \alpha_i \Delta \ln GDP_{t-i} + \sum_{i=1}^{N} \beta_i \Delta \ln X_{t-i} + U_t \quad (4)$$

$$\Delta \ln X_t = b + \psi \hat{e}_{t-1} + \sum_{i=1}^{K} \gamma_i \Delta \ln X_{t-j} + \sum_{i=1}^{L} \theta_i \Delta \ln GDP_{t-i} + V_t \quad (5)$$

Where Δ indicates the first difference operator and U_t and V_t are white noise and uncorrelated processes. The term $\hat{e}_{t-1} = \ln GDP_{t-1} - b_o - b_1 \ln X_{t-1}$ represents the residuals obtained from the cointegrating vector which are containing the long-run information and λ and ψ represent the speed of adjustment after the GDP (exports) deviates from the long-run equilibrium in period $t-1$.

As it has been pointed out, we should remark that though our interest is centred on causal relationship between exports expansion an economic growth, the conclusions obtained from the usual bivariate modelling can be biased. Investigating the interrelationships in greater detail usually requires taking into account the possible indirect effect of other relevant variables in the economic system. Therefore, indirect causal links must be analyzed in higher dimensional dynamic structures. On one hand, and as we have already pointed out, three sub-periods are discerned in the whole analyzed sample in keeping with Cuba's commercial policy-making; in so doing, to go into the real effects of the country's trade decisions, the classical formulation defined by (4)-(5) is firstly extended to a trivariate structure by introducing the terms of trade variable. On the other hand, following Riezman et al (1996) and the very recent empirical contributions of Tang (2006) and Awokuse (2007) the validity of any Export-Led Growth or a Growth-Driven Export phenomenon should take into account the key role of imports not only as intermediate inputs in exports but also for its influence in recovering global and stable positions from possible external disequilibria. Hence, the information set is once again extended by adding the imports of goods and services.

In addition, it is worth mentioning an essential issue regarding the Granger Causality approach itself. Following common practice, in the bivariate model the sequential testing procedure based on likelihood ratios tests to a dynamic VAR structure introduced by Johansen (1991) and Johansen and Juselius (1990) is implemented. Once the existence of long-run relationships is accepted, their direction is checked on the basis of an error correction representation by means of a joint significance test of the coefficients. We note that though cointegration refers to equilibrium in the long-run and causality to short-run precedence both notions are in fact linked: as long as an equilibrium relationship exists in the long-run between a pair of series, there must be some Granger causation in at least one direction between them to provide necessary dynamics. Nevertheless, it turns out that weakness is characterizing this two-step causality approach. As Giles and Mirza (1999) brought to mind, this methodology is calling for pre-testing unit roots and cointegration before causality testing and the results may suffer from size distortions and inference biases leading to an over rejection of the non-causal null hypothesis.

Hence, in those more suitable multivariate frameworks, our point is to carry out Granger Causality test avoiding the cointegration examination though the order of integration and lag structure is still required. For it, we employ the augmented level VAR technique with integrated and cointegrated process. The TYDL procedure consists on over-fit a levels VAR specification with a total of p=(k+$dmax$) lags being k the lag-length chosen by using some information criteria and *dmax* the maximal order of integration for the time series data involved in the system. The asymptotic chi-squared distributed MWald test proposed is applied to the first k VAR coefficient matrix while the coefficient matrices of the last *dmax* lagged vectors in the model are ignored. More precisely, the underling intuition of this approach to Granger Causality is that whenever the elements in at least one of the coefficient matrices A_i are not restricted at all under the null hypothesis (for instance, the non causality restriction (3) which involves in a VAR modelling elements from all A_i, $i = 1,\ldots,k$) it is enough to add extra and redundant lags in estimating the parameters of the structure to ensure the standard asymptotic properties of the Wald statistic which maintains its usual limiting χ^2 distribution. Therefore, the TYDL enables the proposed MWALD statistic to test linear or nonlinear restrictions on these k coefficient matrices using the standard asymptotic theory.

To sum up, the conclusive specification tested is defined by the following four variable (k+$dmax$) order VAR structural modelling linking exports, economic growth, terms of trade and imports[3]

$$\begin{bmatrix} \ln X_t \\ \ln GDP_t \\ \ln TOT_t \\ \ln M_t \end{bmatrix} = \begin{bmatrix} \alpha_{10} \\ \alpha_{20} \\ \alpha_{30} \\ \alpha_{40} \end{bmatrix} + \sum_{i=1}^{k} \begin{bmatrix} \alpha_{11,i} & \alpha_{12,i} & \alpha_{13,i} & \alpha_{14,i} \\ \alpha_{21,i} & \alpha_{22,i} & \alpha_{23,i} & \alpha_{24,i} \\ \alpha_{31,i} & \alpha_{32,i} & \alpha_{33,i} & \alpha_{34,i} \\ \alpha_{41,i} & \alpha_{42,i} & \alpha_{43,i} & \alpha_{44,i} \end{bmatrix} \begin{bmatrix} \ln X_{t-i} \\ \ln GDP_{t-i} \\ \ln TOT_{t-i} \\ \ln M_{t-i} \end{bmatrix} +$$

$$+ \sum_{j=k+1}^{k+1+d\max} \begin{bmatrix} \alpha_{11,j} & \alpha_{12,j} & \alpha_{13,j} & \alpha_{14,j} \\ \alpha_{21,j} & \alpha_{22,j} & \alpha_{23,j} & \alpha_{24,j} \\ \alpha_{31,j} & \alpha_{32,j} & \alpha_{33,j} & \alpha_{34,j} \\ \alpha_{41,j} & \alpha_{42,j} & \alpha_{43,j} & \alpha_{44,j} \end{bmatrix} \begin{bmatrix} \ln X_{t-j} \\ \ln GDP_{t-j} \\ \ln TOT_{t-j} \\ \ln M_{t-j} \end{bmatrix} + \begin{bmatrix} \varepsilon_{X_t} \\ \varepsilon_{GDP_t} \\ \varepsilon_{TOT_t} \\ \varepsilon_{M_t} \end{bmatrix} \quad (6)$$

V. Econometric analysis and results

This section presents the corresponding empirical results for Cuba's exports-growth connection. Prior to run the described Granger Causality tests methodologies for the bivariate and two multivariate dimensional versions, we start by investigating the unit roots in order to examine the stationary and univariate time series properties of each of the time series data involved in modelling.

V.1.Integration properties of the data series

In terms of a distribution moments, a time series generated by a stationary stochastic process must fluctuate around a constant mean, its variance is time-invariant and does not show any trend. However, most of the economic time series are *nonstationary* and its use can falsely imply the existence of a meaningful economic relationship. Hence determining whether a variable follows a trend –stationary or a difference-stationary process, and therefore whether to detrend or to diferenciate it in order to result in a stationary series, is of great importance for any analysis.

Table 2. Augmented Dickey-Fuller test (ADF). Cuba 1960-2004.

$$H_0 : \delta = 0$$
$$H_1 : \delta < 0$$

(i) $\Delta y_t = \beta_1 + \beta_2 t + \delta y_{t-1} + \sum_{i=1}^{m} (\alpha_i \Delta y_{t-i}) + \varepsilon_t$

(ii) $\Delta y_t = \beta_1 + \delta y_{t-1} + \sum_{i=1}^{m} (\alpha_i \Delta y_{t-i}) + \varepsilon_t$

(iii) $\Delta y_t = \delta y_{t-1} + \sum_{i=1}^{m} (\alpha_i \Delta y_{t-i}) + \varepsilon_t$

variable	k	Model (i)			Model (ii)			Model (iii)
		Φ_3	$\tau_{\beta\delta}$	t_{tc}	Φ_1	$\tau_{\alpha\mu}$	t_c	t_{nc}
$\ln GDP$	1	0.240	0.481	-1.423	4.180	1.996	-1.909	1.715
$\Delta \ln GDP$	1	n.a.	n.a	n.a	n.a.	n.a	n.a.	-2.550*
$\ln X$	1	1.34	1.571	-1.946	2.50	1.257	-1.131	1.193
$\Delta \ln X$	1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-4.324* **
$\ln TOT$	1	0.928	1.128	-2.035	1.001	-1.005	-1.787	-1.484
$\Delta \ln TOT$	1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-5.504* **
$\ln M$	1	0.362	0.562	-1.737	3.210	1.970	-1.911	0.603
$\Delta \ln M$	1	n.a.	n.a	n.a	n.a.	n.a	n.a.	-4.097* **

Notes: *k* is the lag structure order chosen to guarantee white noise residuals and Δ is the first differenced lag operator; subscripts *tc*, *c* and *nc* indicate if trend and intercept. intercept or none is included in test equation (iii), (ii) and (i). Φ_3, $\tau_{\beta\delta}$, Φ_1, $\tau_{\alpha\mu}$ denote statistics for individual or joint significance of trend and intercept assuming unit root. * and ** show 5% and 1% significance level in accordance to MacKinnon (1996) critical values; n.a is non available. Results implemented using Eviews 4.1.

In this paper the data univariate characteristics are examined using the Dickey-Fuller (DF) and the Augmented Dickey Fuller (ADF) unit root approaches. On the basis of independently not serial correlated and identical distributed errors, this parametric procedure is assuming a stochastic part modelled by an autoregressive representation testing the null hypothesis of a unit root against the alternative of stationary. Lag-length is selected to ensure non-autocorrelated error terms and the decision tree proposed by Charemza and Deadman (1992) is implemented to check the significance of time trend and drift terms together with non-stationary.

Table 2 summarizes the ADF test over the period 1960-2004[4]. Based on the results neither a trend nor a drift can be accepted; in addition, the null hypothesis of non stationary of the variables cannot be rejected. Hence, at 5% or even 1% levels of significance, all four variables are integrated of order one, I(1), so they are not-stationary in levels but stationary after differencing.

V.2. Exports and GDP. A bivariate analysis

Following common practice, our starting specification is a bivariate structure. In this scenario we assume that the error correction system defined by (4) and (5) is defining the nexus between exports expansion and income growth dynamics. Before analyzing the direction of causality, the first step to estimate the short-run dynamic modelling is to test in each of the considered periods if exports of goods and services and GDP paths are, in their levels form, driven by a common stochastic trend. In checking the cointegration rank of the Cuban exports-GDP system, we make use of the procedure developed by Johansen (1991) and Johansen and Juselius (1991) based on maximum likelihood techniques to a VAR model assuming the Gaussian structure of the residuals.

At this point, an essential choice that has to be made is the number of lagged differences to be included in the models on which the cointegration rank tests are based. Table A1 in the appendix summarizes the level vector autorregresive system estimations. Optimal lag orders are determined in accordance with the information criteria of Schwarz (BIC) and Hannah-Quinn (HQ) which indicate one lagged year for all the periods except for the short-span beginning in the early nineties where a lag length of two guarantees better Gaussian properties of the errors. Assuming this lag structure a range of diagnostic tools are applied: tests for residual autocorrelation (Portmanteau (*Q*) and Breusch-Godfrey Lagrange multiplier (*LM*) proofs), White conditional heterocedasticity and Jarque-Bera non normality via Cholesky factorization show well-behaved Gaussian errors for each of the introduced specifications.

The long-run relationship between exports and GDP is then analyzed. The results for the sequential cointegration rank procedure are reported in Table A2 in the appendix. Let r stand for the number of cointegration vectors running from 0 to h-1 being h=2 the number of endogenous variables included in the modelling. Two likelihood ratios – the *trace* , λ_{trace}, and the *maximal-eigenvalue statistic*, $\lambda_{\max}$, - are used to test that there are at most r cointegrating vectors and that there are r cointegrating vectors against the alternative that $r+1$ exists, respectively. In our analysis, the results of the λ_{trace} and $\lambda_{\max}$ statistics are computed assuming that all trends are stochastic; using the 5% and 10% critical values from Osterwald-Lenum(1992) we found that either in 1960-2004 or 1960-1989 the null hypothesis of non cointegration ($r=0$) can be rejected. Therefore, both statistics confirm the existence of at most one cointegrating equilibrium relationship among the logarithms of GDP and exports at the 95% confidence level. On the contrary, evidence of negatively cointegration in the long-run is found for the sample periods, 1990-2004 and 1970-1989.

Finally, in those periods running from the early sixties to the last eighties and 2004 where GDP and exports of goods and services move together in the long-run, Granger causality test is carry out on the basis of the estimation of the error correction modellings. In so doing, causality deals with the Wald test taking into account the first differences of both variables ($\Delta \ln GDP$ and $\Delta \ln X$) and the one period lagged residuals ($\hat{e}_{t-1}$) obtained from the estimated cointegration rank. For it, the *F*-statistic tests of joint significance of the coefficients involved in equations (4) and (5) in each sample. Table 3 below presents the results of the Granger causality proof. At the 5 percent significance level, in the whole period it is rejected the null hypothesis that exports of goods and services does not Granger-cause GDP and not vice versa. However, the ELG hypothesis that can be addressed for 1960-2004 turns into reverse causality from GDP growth to the exports growth during the 1960-1989 samples[5].

Table 3. Granger causality Test. VECM

Period	Null Hypothesis	*F-statistic*	Number observations
1960-2004	$\ln X \xrightarrow{nc} \ln GDP$	6.052*	44
	$\ln GDP \xrightarrow{nc} \ln X$	0.407	44
1960-1989	$\ln X \xrightarrow{nc} \ln GDP$	0.226	29
	$\ln GDP \xrightarrow{nc} \ln X$	5.153*	29

Notes: *nc* denotes *not* Granger-cause; * indicates significance at the 5% level. Results carried out on Eviews 4.1.

V.3 Terms of trade and imports of goods and services. The multivariate analysis

As we have already pointed out, though our interest focuses on causal linkages between export and income expansion for the Cuban economy, the information set must be enlarged in order to take into account the effect of indirect causal links. Hence, turning to a multivariate analysis the possibilities of multiple channels of influence are introduced in the relation exports-output. In this section we move to higher dimensional systems by including two more relevant economic variables in the export-led-growth analysis: first we introduce the terms of trade and later on the imports of goods and services. Let Model (*i*) and Model (*ii*) stand for the three and four variable respectively.

As it is well known, the multi-step procedure testing causality conditional on the estimation of a unit root, a cointegration rank and cointegration vectors used in Section 2 may suffer from severe pre-test biases. In this section we keep away from looking for the existence of long-run relationships before checking causality. Once we move to these more realistic multivariate structures the causal analysis for these two modellings is carried out by means of the augmented VAR procedure proposed by Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) which allows for causal inference (by testing general restrictions on the parameter matrices) on the basis of an augmented level VAR with integrated and cointegrated vectors.

Before testing for causality an essential issue is to specify the lag-length in each of the considered periods. The general approach is to fit VAR(m) models with orders $m = 0, \ldots, j_{\max}$ and to choose an estimator of the order j that minimizes the criterion. In so doing, the distance between the "true" model and the Kullback-Leiber quantity of information contained in a proposed model is measured by the log-likelihood function with h parameters given by

$$l = -\frac{TR}{2}(1 + \ln 2\pi) - \frac{T}{2}\ln\det(\hat{\Omega}(m))$$

Where $\det(\cdot)$ denotes the determinant, R is the number of equations and $\hat{\Omega}(m) = T^{-1}\sum_{t=1}^{T}\hat{e}_t\hat{e}_t'$ is the residual covariance matrix estimator for a VAR of order m. In measuring the goodness of fit and parsimonious of a model specification, the information criteria of Akaike (AIC), Schwartz (BIC) and Hannah-Quinn (HQ) are defined on the basis of -2 times the average log-likehood function adjusted by a penalty function.

Table A3 in the appendix shows the optimal lag selection in both three and four vector autoregressive structures estimated by OLS over each of the considered periods. In this fashion we prefer lag structures which are the more parsimonious but still long enough to whiten the residuals. For the trivariate model, we can see that AIC and SC choose a lag length of one for all the terms with the exception of two years for the sub-period 1990-2004. Once the imports variable is included, lag selection is based on the AIC and HQ criteria which indicate two lags for those long periods starting in the sixties and one for the shorter ones -1990-2004 and 1970-1989.

Given that VAR(k) has been selected for each three and four variable autoregressive modelling in each of the considered periods, the last point is to determine the maximal order of integration that might occur in the process. As long as all the variables have been found to be at most I(1), an extra lag may be added in each of the periods so $dmax$=1 in both three and four variable modelling.

To conclude, and overfitting the true VAR order, we estimate a levels VAR with a total of $p=(k+dmax)$ lags. For the Granger-Causality tests, we apply standard Wald test to the first k VAR coefficient matrix excluding the extra parameters in testing for Granger causality. Table 4 and Table 5 report all the results of the MWALD test for the augmented VAR models (*i*) and (*ii*) respectively.

Table 4. GDP. exports and TOT Granger causality Test. Augmented VAR model

Period	Dependent variables	MWALD-Statistics: Source of causation $\ln GDP$	$\ln X$	$\ln TOT$
1960-2004	$\ln GDP$	n.a.	4.9033 (0.0267)	1.5908 (0.2078)
	$\ln X$	4.631 (0.0314)	n.a.	0.3725 (0.515)
	$\ln TOT$	3.181 (0.0745)	21.74 (0.0000)	n.a.
1960-1989	$\ln GDP$	n.a.	0.1121 (0.7377)	0.7855 (0.7699)
	$\ln X$	0.6266 (0.4289)	n.a.	1.6068(0.7699)
	$\ln TOT$	1.842 (0.1747)	0.2532(0.0124)	n.a.
1990-2004	$\ln GDP$	n.a.	0.3663 (0.5450)	0.4140 (0.5483)
	$\ln X$	0.04744 (0.9451)	n.a.	0.0134(0.9020)
	$\ln TOT$	5.002 (0.0253)	16.35483(0.01)	n.a.
1970-1989	$\ln GDP$	n.a.	0.34096(0.5593)	0.6274 (0.4279)
	$\ln X$	0.1910 (0.6620)	n.a.	13.606(0.002)
	$\ln TOT$	3.7504 (0.0528)	4.0533(0.00441)	n.a.

Notes : The $[k+d(\max)]$th order level VAR has been estimated with $d(\max)=1$. Lag length selection follows Table 6 results Values in parentheses are p-values

From the application of the TYDL methodology in the three-dimensional analysis (see Table 4), we note that in 1960-2004 exports of goods and services "Granger- cause"

GDP at the 95% confidence level then supporting the ELG hypothesis; for the same sample, the export equation results indicate that the null hypothesis that exports are not caused in the Granger sense by GDP can also not be rejected at the 5% significance level , showing the existence of the positive influence of GDP on their dynamic. Hence, we observe that the causal link between exports and economic growth in Cuba is bidirectional in the whole period 1960-2004. However, no causal relationship can be addressed in any of the analyzed sub-periods.

As long as export expansion and openness to foreign markets are considered as key determinants of economic growth, our point is to take into account the effect of imports. In the Cuban case, though in the short-run some mismatches can be observed, exports co-moved with imports of goods and services in the long-term. This joint movement is reflected by high correlation coefficients over 0.95 for all the periods expect for the period 1990-2004 that drops up to 0.86. Turning to the four variable causality results (see Table5), we can conclude that, at least in the Granger sense, either the ELG hypothesis or the GLE phenomenon can be strongly rejected at the 5% and even 10% significance level. Interestingly, the GDP equation results show a positive casual relationship going from imports of goods and services to the Cuban growth path in all the periods but 1990-2004.

This finding is implying that imports are causing growth in Cuba suggesting Import-led Growth (ILG) causality and so, imports are more important for Cuban economy to grow than exports. In 1990-2004, period we do not find a ILG causality pattern but a direct causality flowing from output to exports (GLE) and, interestingly, causality from imports to exports.

Table 5. GDP. Exports, TOT, Imports. Granger causality Test. Augmented VAR model

Period	Dependent variables	MWALD-Statistics Source of causation			
		$\ln GDP$	$\ln X$	$\ln TOT$	$\ln M$
1960-2004					
	$\ln GDP$	n.a.	0.3200 (0.5073)	0.093(0.793)	4.1304 (0.0421)
	$\ln X$	0.095 (0.7575)	n.a.	4.6063(0.0319)	0.5981(0.4393)
	$\ln TOT$	7.3428 (0.0067)	3.8247 (0.0505)	n.a.	0.0012(0.9719)
	$\ln M$	0.005938(0.9399)	1.491(0.2220)	0.04285(0.8359)	n.a.
1960-1989					
	$\ln GDP$	n.a.	0.0192 (0.8997)	0.0849 (0.770)	4.6991(0.032)
	$\ln X$	0.8679 (0.3515)	n.a.	4.906(0.0259)	1.971(0.1603)
	$\ln TOT$	5.905 (0.0151)	1.98(0.1593)	n.a.	2.744(0.097)
	$\ln M$	0.051(0.813)	0.05375(0,8166)	0.048(0.9442)	n.a.
1990-2004					
	$\ln GDP$	n.a.	1.0297 (0.3120)	0.5634 (0.4529)	0.1147 (0.748)
	$\ln X$	4.343 (0.0372)	n.a.	0.9808(0.3220)	3.3632(0.060)
	$\ln TOT$	23.050 (0.000)	20.56(0.0000)	n.a.	3.70(0.0544)
	$\ln M$	0.0809(0.7760)	0.1022(0.7492)	5.3095(0.025)	n.a.
1970-1989					
	$\ln GDP$	n.a.	7.69e-05(0.9930)	0.7702 (0.380)	3,8444(0.0499)
	$\ln X$	0.8058 (0.399)	n.a.	0.0606(0.1013)	0,3125(0.5761)
	$\ln TOT$	8.363 (0.0038)	8.8001(0.030)	n.a.	6,2252(0,0126)
	$\ln M$	0,387(0,5336)	0.327 (0,5071)	0.0603(0.8060)	n.a.

Notes : The $[k+d(\max)]$th order level VAR has been estimated with $d(\max)=1$. Lag length selection follows Table 6 results. Values in parentheses are p-values

VI. Conclusions.

This paper, reports on new empirical developments in international trade literature and, more precisely, to the crucial role of a country's external sector position on its growth performance and the so-called export-led growth phenomenon. Despite the lack of empirical works, few would disagree that Cuba's international trade restrictions have been a central issue in its income path. In addition, though it is well known that services -especially tourism- are playing a key role in all aspects of this economy, up until today, no single generally empirical analysis has demonstrated the role of international trade of both good and services as an engine of growth for Cuba.

There are two essential conclusions that crops up from this paper. First, our results clearly support the idea that bivariate causality analysis in the relationship between exports and output is affected by spurious correlations because of the bias in favour of correlation driving to mistaken interpretations in the ELG or GLE hypothesis, as suggested by Sheehey (1990). In this sense, for the Cuban economy either the export-led-growth (ELG) and the growth-led-export (GLE) hypothesis is, at least, weak. By adding new relevant variables to test for indirect effects, we have obtained that the incorporation of terms of trade not only preserves but also reverses the casual relationship flowing from exports to growth in the whole period. The second conclusion derives from the multivariate causality when terms of trade and imports are included in the analysis. Once the model is extended concerning the significance of imports of goods and services, the causality link, at least in Granger's sense, between export expansion and growth fades away. On the contrary, a striking result for Cuba is that whenever exports and imports of goods and services show high correlated movements, economic growth in Cuba is responsive to import expansion. So, imports seem to be more important for Cuban economic growth than exports suggesting an Import led growth (ILG) hypothesis (Awokuse, 2007).

When including different periods we observe that in the whole sample and in the COMECON analysed periods (that is, 1960-2004, 1960-1989 and 1970-1979) ILG causality is verified and only in the 1990-2004 period, though a long-run match can still be observed, correlation disappears and imports appear to not Granger cause growth. What is suggesting that? From our point of view, ILG results suggest that during socialist regulation of international trade period the Cuban economy was able to get imports, principally of capital and intermediate goods and, in general, of more technological advance inputs for Cuban production, from the soviet block and these were the base of the Cuban output expansion. At the same time, primary exports to the soviet block financed Cuban imports at preferential prices. At this point, our results for Cuba tend to support the hypothesis exposed by Krugman (1984) and, in general, for the technological approaches of international trade and development and endogenous models (Dosi and Soete, 1988 and Coe and Helpman, 1995).

When the *administered* international trade period ended for Cuban economy in 1990, ILG causality does not generate growth due to an intense dropped in the Cuban imports since 1990, especially capital and intermediate goods imports. However, we obtain in this period 1990-2004 that growth causes exports and that imports causes exports, reflecting again the importance of imports in the economic growth path in this case linked directly to exports growth. So, a major conclusion is the imperious necessity of importing for Cuban economy to grow.

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[1] Following common practice, terms of trade are constructed as the ratio of imports prices to exports prices so, a negative rate of growth implies an improvement of terms of trade and, vice versa, a positive rate of growth implies deterioration.

[2] In the same way, y_t does not Granger-causes x_t whenever $\alpha_{21,i} = 0$ for $i = 1,2,\dots, p$

[3] Note the trivariate specification is identical to the (6) by omitting in the variable and estimator matrices the last row corresponding to the imports field.

[4] Not reported here but available on request, we note that all the variables are found to be integrated of order one in each of the analyzed sub-periods.

[5] Not included here for brevity causality in the bivariate case is also analyzed by means of the augmented VAR level methodology. The results are identical from that obtained on the VECM.

VII. References.

Ahmad, J. and Kwan, A. C. C. (1991) Causality between exports and economic growth: Empirical evidence from Africa. *Economics Letters*, 37, pp. 243-48.

Arrow, K. (1962) The economics implications of Learning by Doing. *Review of Economic Studies,* 29, June, pp. 155-173.

Awokuse, T.O. (2007) Causality between exports, imports and economic growth. Evidence from transition economies. *Economics Letters*, 94, pp. 389-995.

Awokuse, T.O. (2005a) Export-led growth and the Japanese economy: evidence from VAR and directed acyclic graphs. *Applied Economics Letters*, 12, pp. 849-858.

Awokuse, T.O. (2005b) Export, economic growth and causality in Korea. *Applied Economics Letters,* 12, pp. 693-696.

Bahmani Oskooee, M. and Alse, J. (1993) Export growth and economic growth: an application of cointegration and error correction modelling. *Journal of Developing Areas*, 27, pp. 535-542.

Bahmani-Oskooee, M. Economidou, C. and Gobinda Goswami, G. (2005) Export led growth revisited: A panel cointegration approach. *Scientific Journal of Administrative Development*, 3, pp. 40-55.

Balaguer J. and Cantavella-Jordá, M. (2001): Examining the Export-Leg Growth Hypothesis for Spain in the Last Century. *Applied Economics Letters*, 8, pp. 681-685.

Balassa, B. (1978) Exports and economic growth: further evidence. *Journal of Development Economics*, 5, pp. 181-189.

Begum, S. and Shamsuddin, A. F. (1998) Exports and Economic Growth in Bangladesh. *Journal of Development Studies*, 35 (1), pp. 89-114.

Charemza W.W. and Deadman, F.D. (1992) *New Directions in Econometric* Practice Brookfiels VT_ Edward Elgar

Coe, T. D. and Helpman, E. (1995) International R&D spillovers. *European Economic Review*, 39, pp. 859-887.

Cribeiro Y. and Triana, L. (2005) Las Elasticidades en el Comercio Exterior Cubano: Dinámica de corto y Largo plazo. Degree dissertation. Universidad de la Habana. Santiago de Cuba.

Cuadros, A., Orts, V. and Alguacil, M. (2004) Openness and Growth: Re-Examining Foreign Direct Investment, Trade and Output Linkages in Latin America. *The Journal of Development Studies*, Vol. 40 (4), pp. 167-192.

Dolado. J.J. and Lutekepohl. H. (1996) Making Wald test work for cointegrated VAR systems. *Econometrics Reviews*, 15, pp. 369-386.

Dosi, G. and Soete, L. (1988) Technical change and international trade, in: G. Dosi, et. al., (eds) *Technical Change and the Economic Theory*, (London: Pinter Publishers), pp. 401-431.

Feder, G. (1982) On export and economic growth. *Journal of Development Economics*, 12, pp. 59-73.

Foster, N. (2006) Exports, growth and threshold effects in Africa. *Journal of Development Studies*, 42 (6), pp. 1056-1074.

Granger, C. W. J. (1969) Investigating causal relations by econometric models and cross-spectral methods. *Econometrica,* 37, pp. 424-438.

Giles J.A. and C.L. Mirza (1999) Some Pretesting Issues on Testing for Granger non-causality (Mimeo) Department of Economics, University of Victoria, Econometrics Working Papers Nº 9914.

Giles, J.A. and C.L. Williams (2000) Export-led Growth: a Survey of the Empirical Literature and some Non-Causality Results. Part 1*, Journal of International Trade and Economic Development,* 9, pp. 261–337.

Goldin, I and Reinert, K. A. (2005) Global capital flows and development: A Survey. *The Journal of International Trade & Economic Development*, Vol 14 (4), pp. 453 - 481

González, A. (1993) *Cuba: Escenarios del Modelo Económico en los Años Noventa* (La Habana: INIE).

Grossman, G. M. and Helpman, E. (1991) *Innovation and Growth in the Global Economy* (Cambridge: MIT Press).

Helpman, E. and Krugman, P. R. (1985) *Market structure and Foreign trade* (Cambridge (Mass.): MIT Press).

Hicks, J. (1950) *The trade cycle* (Oxford: Clarendon Press).

Islam, M. N. (1998) Export expansion and economic growth: testing for cointegration and causalit., *Applied Economics*, 30, pp. 415-425.

Johansen, S. (1991) Estimation and Hypothesis testing of Cointegration Vectors in Gaussian Vector Autorregresive Models. Econometrica, 59, 1551-1580.

Johansen, S. and K. Juselius (1990) Maximum Likelihood Estimation and Inferences on Cointegration-with aplications to the demand for money, *Oxford Bulletin of Economics and Statistics*, 1990, 52, 169-210.

Kónya, L. (2006) Exports and growth: Granger causality analysis on OECE countries with a panel data approach. *Economic Modelling*, 23, pp. 978-992.

Kravis, I. B. (1970) Trade as handmaiden of growth: similarities between the nineteenth and twentieth centuries. *Economic Journal*, 80, pp. 850-870.

Krugman, P.R. (1996) *Rethinking International Trade* (Cambridge: MIT Press).

Krugman, P. R. (1987) Is free trade passé?. *Economic Perspectives*, 1, pp. 131-144.

Krugman, P.R. (1984) Import protection as export promotion, in: H. Kierzkowski (ed) *Monopolistic competition in international trade* (Oxford: Oxford University Press).

Lamfalussy, A. (1963) *The United Kingdom and the six: An essay on economic growth in Western Europe* (London: Macmillan).

Lucas, R. E. (1988) On the mechanism of economic development. *Journal of Monetary Economics*, 22, pp. 3-42

McCombie, J. S. L. and Thirwall, A. P. (1994) *Economic Growth and the Balance-of-Payments Constraint*, (London: MacMillan Press).

MacKinnon, J. (1996) Numerical Distribution Functions for the Unit Root and Cointegration Tests. *Journal of Applied Econometrics*, 11, pp. 601-618.

Mendoza Y. and Roberts, L. (2000) El Crecimiento Económico y las Restricciones en el Sector Externo: Una Aplicación al Caso Cubano. Cuba: Investigación Económica, septiembre-diciembre.

Osterwald-Lenum, M. (1992) A note with quantiles of the asymptotic Distribution of the Maximun Likelihood Cointegration Rank Test Statistics. *Oxford Bulletin of Economics and Statistics*, 54, pp. 461-474.

Prebisch, R. (1950) *The economic development of Latin America and its principal problems* (New York: ECLA, United Nations).

Prebisch, R. (1959) Commercial Policy in the underdeveloped countries. *American Economic Review*, 49 (2), pp. 251-273.

Ram, R. (1985) Exports and economic growth: some additional evidence. *Economic Development and Cultural Change*, 33, pp. 415-425.

Richards, D. G. (2001) Exports as determinant of Long-run growth in Paraguay, 1966-96. *Journal of Development Studies*, 38 (1), pp. 128-146.

Riezman, R., Whiteman, C.H. and Summers, P.M. (1996) The engine of growth of its handmaiden? A time-series assessment of export-led growth. *Empirical Economics*, 21, pp. 77-110.

Singer, H. W. (1950) The distribution on gains between investing and borrowing countrie. *American Economic Review*, 40 (2), pp. 473-485.

Sheehey, E. J. (1992) Exports and growth: Additional evidence. *Journal of Development Studies*, 28 (4), pp. 730-734.

Sheehey, E. J. (1990) Exports and growth: A flawed framework. *Journal of Development Studies,* 27 (1), pp. 111-116.

Siliverstovs, B. and Herzer, D. (2006) Export-led growth hypothesis: evidence for Chile. *Applied Economics Letters*, 13, pp. 319-324.

Smith, A. (1776) *Investigación sobre la naturaleza y causas de la riqueza de las naciones* (México: Fondo de Cultura Económica).

Tang, T. C. (2006) New evidence on export expansion, economic growth and causality in China. *Applied Economics Letters*, 13, pp. 801-803.

Thirlwall, A.P. (1979) The Balance of Payments Constraint as an Explanation of International Growth Rate Differences. *Banca Nazionale del Lavoro Quarterly Review*, January, 128, pp. 45-53.

Toda. H. Y. and Yamamoto. T. (1995) Statistical inference in vector autoregression with possibly integrated processes. *Journal of Econometrics*, 66, pp. 225-250.

Van den Berg, H. and Schmidt, J. R. (1994) Foreign trade and economic growth: time series evidence from Latin America. *Journal of International Trade and Economic Development*, 3, pp. 249-268.

APPENDIX

Table A1. VAR: GDP-EXPORTS. Lags and residuals.

	Information criteria				Lag	Residuals			
Period	*LR*	*AIC*	*BIC*	*HQ*		*Q*	*LM*	*White*	JB_{Chol}
1960-2004	180.101^{+}	-3.994	-3.745^{+}	-3.903^{+}	1	39.770*	3.431*	13.440*	1.532*
1960-1989	109.559^{+}	-3.881^{+}	-3.593^{+}	-3.795^{+}	1	26.088*	1.223*	19.059*	1.637*
1990-2004	7.380	-4.842^{+}	-4.370^{+}	-4.847^{+}	2	12.043*	0.704*	30.750*	4.586*
1970-1989	76.273^{+}	-3.995^{+}	-3.696^{+}	-3.937 $^{+}$	1	22.434*	3.746*	19.441*	0.841*

$^{+}$ indicates lag order selection on information criteria *shows non 5% significance. Lags for Q and ML are considered as the third part of the observations . Results calculated by Eviews 4.1

Table A2. Johansen and Juselius Cointegration Test

		Johansen Test				
Period	Lags	Number of cointegration Relations under Ho	Statistics			
			λ_{trace}	Critical Values 95% and 99%	$\lambda_{\max}$	Critical Values 95% and 99%
1960-2004	1	r=0	28.574* **	15.41/20.04	25.319* **	14.07/18.63
		r=1	3.255	3.76/ 6.65	3.255	3.76/6.65
1960-1989	1	r=0	16.652*	15.41/ 20.04	15.919*	14.07/18.63
		r=1	0.733	3.76/6.65	0.733	3.76/ 6.65
1990-2004	2	r=0	13.219	15.41/20.04	10.983	14.07/ 18.63
		r=1	2.235	3.76/6.65	2.235	3.76/6.65
1970-1989	1	r=0	17.437*	15.41/ 20.04	11.446	14.07/ 18.63
		r=1	5.99*	3.76/ 6.65	5.99*	3.76/6.65

Notes: Lag structure is drawn in each period from Table 3 results. *(**) denotes rejection of the hypothesis at the 5%(1%) level taking into account Osterwald-Lenum critical values. Results computed with Eviews 4.1

Table A3. VAR model. Lag selection and Information Criteria

VAR Model (*i*): $\ln GDP, \ln X, \ln TOT$

Period	*Lags(k)*	*l*	*AIC*	*SC*	*HQ*
1960-2004	1	130.11	-5.36*	-4.88*	-5.18*
1960-1989	1	92.66	-5.55*	-4.99*	-5.38*
1990-2004	2	78.86	-7.71*	-6.72*	-7.72*
1970-1989	1	70.20	-5.82*	-5.22*	-5.70*

VAR Model (*ii*): $\ln GDP, \ln X, \ln TOT, \ln M$

Period	*Lags(k)*	*l*	*AIC*	*SC*	*HQ*
1960-2004	2	194.03	-7.35*	-5.87*	-6.80*
1960-1989	2	143.31	-7.66*	-5.95	-7.14*
1990-2004	1	82.55	-8.34*	-7.39*	-8.35*
1970-1989	1	97.31	-7.73*	-6.73*	-7.53*

Notes: * indicates lag-order selected by the criterion; *l* is the log of the likelihood function with *h* parameters estimated using *T* observations and the information criteria of Akaike, Schwarz and Hannah-Quinn are defined by

$$AIC = -2(l/T) + 2(h/T)$$
$$BIC = -2(l/T) + h\log(T)/T$$
$$HQ = -2(l/T) + 2h\log(T)/T$$