International Journal of Economics, Commerce and Management
United Kingdom Vol. III, Issue 7, July 2015
http://ijecm.co.uk/ ISSN 2348 0386

IMPACT OF EXPORT ON ECONOMIC GROWTH IN MADAGASCAR

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Sponsor: The National Natural Science Foundation of China (No.71373154), for the financial support

Abstract

The relation between exports and growth is an important one in economics, particularly for developing countries through economic reform. This paper analyzes the theory behind the role that the exports play in growth for Madagascar, using data from 1983 to 2013. During this period, Madagascar changed its economic policy from industrialization substitution-importation to extreme getting into debt program. This paper uses variety of analytical tools, including co integration analysis, unit roots, coupled with VAR and IRF analysis. The data show a mostly positive and significance relationship between exports and growth, introducing results for the other independent variables, as investment and population.

Keywords: Export, economic growth, Co-integration, VAR, Unit roots, and Madagascar

INTRODUCTION

By achieving independence in 1960, Madagascar had all advantages to ensure food self-sufficiency and reduce its economic dependence toward the mainland. With a pre-industrial economy regime, the country had chosen an economic policy based on improving the local supply capacity by purchasing raw materials at the foreign market and capital goods, in support, a process of substitution industrialization engaged. However, Madagascar economic growth was modest even stagnant. From the mid-70s to early 1980s, the country has followed a

strategy of self-centered and interventionist development, focusing on industrialization and relegating agriculture to a supporting role.

The policy of import substitution of consumer goods (food, textiles, building materials) with high taxation of imports, the withdrawal of the free trade area, the public investment strategy excessively uncoordinated, nationalization of private companies, price controls and external transactions and taxation of exports, led to worsening terms of trade and has negatively affected the country's export revenues. Thus, other problems were linked as the worsening of the balance of payments deficit that cause high external indebtedness and an inflationary spiral, leading to major macroeconomic imbalances, which have slowed economic growth.

To remedy these imbalances, Madagascar has committed to adopt fiscal stabilization measures focused on adjusting demand and embarked on the Structural Adjustment Program (SAP) in the mid 1980s.

The underlying idea is that the elimination of past distortions and the opportunities that international trade would be sufficient to take the economy off. Eventually, the country hoped that exports would become an engine of economic growth. Thus, the authorities have conducted a series of economic reforms based on economic activities liberalization process in order to improve incentives for the private sector.

Quantitative restrictions on imports or export licenses and reduction of tariff barriers have been gradually lifted. However, other measures have been only carried out from 1990. These are the liberalization of key sectors (mining, fisheries, oil sectors, energy, communications, air transport), authorization to contract a long-term lease of 99 years for foreigners, and the establishment of export processing enterprises. They were done to encourage foreign private investment.

Despite the existence of external and internal constraints in the implementation of the reform, signs of improvement were observed both in export and in terms of economic growth.

Export earnings have progressed in a significant way from 2000 and the country has gradually returned to growth, which has now exceeded the growth rate of the population. However, these dynamics are still limited. Exports are still concentrated on a few products and the exported volume remains volatile from year to another. Indeed, over the period 1983 to 2013, export has experienced annual variations ranging and the share of exports in real GDP increased slowly for several decades.

So after more than two decades of reform and given the evolution of some macroeconomic indicators in Madagascar, few questions arise about the role of exports in economic growth: *What is the direction of causality between these two variables?*
Has the instability of exports affect economic growth?

This study attempts to provide some answers to these questions thorough the analysis focuses on the characteristics of exports in Madagascar, including its contributions to economic growth by understanding the theories concerning the hypothesis where the export can bring economic growth, identifying the different empirical models previously used and specifying and estimating the model time series to determine the exact impact of exports on economic growth in Madagascar.

In its structure, the present paper reviews at the section one the introduction, section two the literature review and come next the methodology. The section four highlight the empirical result followed by the discussion in section five. Finally, the section six concludes this paper.

LITERATURE REVIEW

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

Theoretical literature

According to the traditional Keynesian theory, an increase in exports is one of the factors that can cause increases in demand and thus will surely bring about increases in outputs, all other things being equal (Lin and Li, 2007). It is important to note that though this approach is highly sophisticated and robust, it has not been widely used. This is partly because of the remnant of Say's law in people's mind (McCombie and Thirlwall, 1994). Indeed most people believe that the major constraints of modern economic growth lie on the supply side instead of on the demand side.

In other words, they believe that only increases in factor inputs and improvements in economic efficiency can stimulate economic growth (Lin and Li, 2007). However, proponents of the demand- oriented analysis disagree with the above view and argue persuasively that it is

growth in exports that is the major stimulant of aggregate economic activity and economic growth.

Nadeem (2007) provided the empirical analysis of the dynamic influences of economic reforms and liberalization of trade policy on the performance of agricultural exports in Pakistan. The author examined the effect of both domestic supply side factors and external demand on the performance of agricultural exports. The major finding of the study was that export diversification and trade openness contributed more in agriculture domestic side factors performance. The results of the study suggested that agricultural exports performance is more elastic to change in domestic factors.

Pazim (2009) tested the validity of export-led growth hypothesis in three countries by using panel data analysis. And, it is concluded that there exists no significant relationship between the size on national income and amount of exports for these countries on the basis of one-way random effect model. The panel unit root test shows that the process for both GDP and exports at first glance is not stationary, while the panel co-integration test indicates that there is no co-integration relationship between the exports and economic growth for these countries.

Sanjuan-Lopez and Dawson (2010) estimated the contribution of agricultural exports to economic growth in developing countries. They estimated the relationship between Gross Domestic Product and agrarian and non-agrarian exports. Panel co integration technique 13 was used in analyzing the data set of 42 underdeveloped countries. The results of the study indicated that there existed long run relationship and the agriculture export elasticity of GDP was 0.07. The non-agriculture export elasticity of GDP was 0.13.

Based on the empirical results, the study suggested that the poor countries should adopt balanced export promotion policies but the rich countries might attain high economic growth from non-agricultural exports.

Elbeydi, Hamuda and Gazda (2010) investigated the relationship between exports and economic growth for Libya for the period 1980 to 2007. The findings indicate that there exists a long-run bi-directional causality between exports and income growth, and thus, the export promotion policy contributes to the economic growth of Libya.

Rahmaddi and Ichihashi (2011) have approached the study on exports and economic growth in Indonesia: A causality approach based on multivariate error correction model. Study concluded that, significance of both exports and economic growth to economy of Indonesia. In addition, researchers found no supporting evidence of positive causality from intermediate imports to GDP per capital. Safdari et al. (2011) explores causal relationship between export

and economic growth for 13 developing countries, for period of 1988-2008, using panel VECM. There result depicts unidirectional reverse causality running from economic growth to exports.

Shehu and Youtang (2012) examined the causal relationship between exchange rate volatility (ERV), trade flows and economic growth of the sub-Saharan African countries with the reference to Nigeria, which is considered as small open economy. The empirical study has been based on a time series data over the period of 1970-2009. Researchers applied new advances in the field of time series econometrics to provide more reliable estimates. The results indicate significant effects of ERV on trade flows and economic growth of Nigeria. The findings support the preference of flexible exchange rate regime over the fixed regime as it facilitates more trade flows in Nigeria. Researchers recommend effective diversification of the Nigeria economy by encouraging more manufacturing firms' production.

Pistoresi and Rinaldi (2012) investigate relationship between real exports, imports and GDP in Italy from1863 to 2004, using cointegration and causality tests. The results conforms existence of cointegration but the direction of causality varies over time. Period prior to the First World War import growth led GDP growth, which turned into GDP-led export growth. Bidirectional causality is, observed in post-Second World War period.

Kalaitzi (2013) examined the relationship between exports and economic growth in the United Arab Emirates over the period 1980-2010. The study applied the two-step Engle-Granger cointegration test and the Johansen cointegration technique in order to confirm or not the existence of a long-run relationship between the variables. Moreover, this study applied a Vector Auto regression Model in order to construct the Impulse Response Function and the Granger causality test to examine the causality between exports and economic growth. The findings of this study confirmed the existence of a long-run relationship between manufactured exports, primary exports and economic growth. In addition, the Granger causality test showed unidirectional causality between manufactured exports and economic growth. Thus, further increase in the degree of export diversification from oil could accelerate economic growth in UAE.

Ahdi, and others (2013) investigated the dynamic causal link between exports and economic growth using both linear and nonlinear Granger causality tests. The study used annual South African data on real exports and real gross domestic product from 1911-2011. The linear Granger causality result showed no evidence of significant causality between exports and GDP. Accordingly the study turned to the nonlinear methods to evaluate Granger causality between exports and GDP. It used both Hiemstra and Jones (1994) and Diks and Panchenko (2005) nonlinear Granger causality tests. For the Hiemstra and Jones (1994) test, it found study found evidence of significant bidirectional causality.

Empirical review

It is important to note that a large number of studies on the importance of exports in economic performance and the relationship between export and aggregate economic activity/economic growth have been conducted over the years, particularly in recent years. It is gratifying to observe that in recent times, there has been great and increasing interest in the study of exports and economic growth within the context of developing countries; a great number of research works have captured this interest. The research works may be said to be of two main categories.

The first category concentrates on individual countries and assesses the implications of export promotion versus import substitution strategies for economic growth (Bhagwati, 1978 and Krueger, 1978). As observed by Fosu (1990), such analyses may provide useful country specific information on the success or failure of various development mechanisms, at least as they relate to the period of analyses. However, the long gestation periods associated with economic projects, in conjunction with the usual lack of adequately detailed data for individual countries, may prevent the proper evaluation of the importance of exports in any general fashion.

The second category of studies examines the extent to which export performance differences may explain inter-country economic growth differentials. Studies in this category include Balassa (1978 and 1985), Ram (1985), Feder (1982) and Michaely (1977). Most of These studies employed a production function framework that included exports as an additional argument of the production function. As shown by Fosu (1990) and Uche (2009), the standard justification for such a treatment is based on the fact that the development of exports allows the home country to concentrate investment in those sectors where it enjoys a comparative advantage and the resulting specialization is likely to augment overall productivity; similarly the larger international market permits economies of scale to be realized in the export sector; in the same way worldwide competitive pressures are likely to reduce inefficiencies in the export area and result in the adoption of more efficient techniques in the overall traded goods sector; and a larger export sector would make available more of the resources necessary to import in a more timely fashion both physical and human capital, including advanced technologies in production and management, and for training higher quality labor.

The numerous studies on exports and economic growth as found in the literature were conducted along various methodological lines. The early studies examined the simple correlation coefficient between export growth and economic growth (Michaely, 1977 and Balassa, 1978). These studies in general concluded that there is strong evidence in favor of the export-led growth hypothesis based on the fact that export growth and economic growth were found highly correlated. The principal weakness of this group of studies is that they used a high

degree of correlation between the two variables as evidence supporting the export-led growth hypothesis. But high degree of correlation between the two variables is not a sufficient condition to validate the export-led growth hypothesis. It is well known in econometrics and statistics that correlation does not necessarily imply causality.

Following the early group of studies on exports and economic growth, we have the next group, which may be called the second generation of studies on the issue. This group examined whether or not exports are driving output by estimating output growth regression equations based on the neoclassical growth accounting technique of production function analysis, including exports or export growth as an explanatory variable (Feder, 1982; Balassa, 1985; and Ram, 1987). This second generation of studies used a highly significant positive value of the coefficient of export growth variable in the growth accounting equation and a significant improvement in the coefficient of determination with the inclusion of the export growth variable in the regression equation as evidence for the export-led growth hypothesis. This group of studies has been severely criticized based mainly on a methodological issue (Ekanayake, 1999). The studies in general made a priori assumption that export growth causes output growth and they did not consider the direction of causal relationship between the two variables.

There is a third generation of studies, which is relatively recent. This group of studies laid emphasis on causality between export growth and economic growth. This approach has been taken in a large number of recent studies designed to assess whether or not individual countries exhibit evidence for export-led growth hypothesis using Granger (1969) or Sims (1972) causality test (Ahmad and Kwan, 1991; Serletis, 1992; Jin and Yu, 1995; and Holman and Graves, 1995).

The major weakness of this generation of studies (that are based on causality tests) is that the traditional Granger and Sims causality tests used in the studies are only valid if, among other things, the original time series are not co-integrated; the tests are invalid and misleading when the original time series are integrated of order one and are co-integrated. (Granger, 1980, 1986 and 1988. Engel and Granger, 1987; and Ahmad and Harnhirun, 1996).

Therefore, there is need for one to check for stationarity and co-integration properties of original exports and output time series before using Granger or Sims causality test. Despite the weaknesses associated with the techniques adopted by the foregoing generations of studies they are still very relevant for they can provide useful insights on the relationship between exports and economic growth. Indeed the techniques serve as simple and handy analytical methods of testing the validity of the export-led growth hypothesis and other related hypotheses. It is interesting to point out here that there have been relatively new studies on exports and

economic growth that have used modern econometric techniques of co-integration and error-correction models (Oxley, 1993; Ghatak, Milner and Utkulu, 1997; and Islam, 1998).

As observed by Ekanayake (1999), this new generation of studies does not suffer from the shortcomings found in the methodologies adopted in the previous studies. In fact, the new group of studies has produced highly robust and reliable results; this is largely because they used modern econometric techniques that are not only highly sophisticated but also highly efficient.

In the two recent studies, ELG hypothesis is investigated Latin American countries. (Herzer et. al., 2004), using Chilean time series data 1960-2001, employed single equation and system cointegration techniques to analyze the productivity effects of manufactured and primary exports. They found that exports of manufactured products are important for productivity and therefore for long-run economic growth. Zuniga investigated whether there exist the export-led growth for Honduras and five other Latin American countries. He employed the following variables real GDP, real gross capital formation, labor in numbers and real exports for the 1970-2000 period. His findings support ELG hypothesis only in El Salvador in short run and totality cases. ELG hypothesis is still valid in the long run for Guatemala and for non-agricultural sector of Honduras. Exports Granger causes economic growth in the long run and in totality for Nicaragua. For Costa Rica, Honduras and agricultural GDP sector of Honduras, the ELG hypothesis could not be supported.

There is a dearth of studies on exports and economic growth based on modern econometric techniques in Nigeria. The few studies on exports and economic growth in Nigeria that used modern econometric methods that is within our reach include Ekpo and Egwaikhide (1994), Odusola and Akinlo (1995), Idowu (2005) and Uche (2009). These studies suffer from some methodological defects. Ekpo and Egwaikhide (1994) analyzed the relationship between exports and economic growth within the framework of a general production function.

The study employed modern econometric techniques of co-integration and error correction model in its analysis. In particular, the study used the Engel-Granger two-step procedure of co-integration as well as the associated error correction modeling technique in the analysis. The study in general validated the export-led growth hypothesis for Nigeria. However, the study did not address the issue of causality and the direction of causality. Suffice it to say that the issue of causality is very crucial in assessing the validity of the export-led growth hypothesis.

Uche (2009) in his studies employed econometric methodologies to assess the impact of oil export and non-oil export on the growth of Nigerian economy and discovered that there is a unidirectional causality from oil export to GDP which goes to support the export-led-growth in

the case of Nigeria but with reference to oil sector only. He also found non-oil export does not granger cause economic growth in Nigeria. This work followed most of the set rules in econometric analysis and may have generated a robust result but was not able to cover up to 2011 period, and government have taken a number of steps to improve the non-oil sector of the Nigerian economy and the effect of these policies and program by the government may have improved the impact of non-oil sector to the growth of Nigerian economy. And so, a resent look at this subject area becomes important to give consideration to the responds of these government policies and program aimed at improving the non-oil sector of the economy. Thus this study intends to correct these methodological defects in most of the works mentioned. It is worthwhile to further point out that the earlier studies did not recognize the dichotomy between oil exports and non-oil exports except Uche (2009).

Lorde (2011) investigates validity of export led growth hypothesis for Mexico, using cointegration and Granger causality for the period of 1960-2003. The empirically result reveals only short run causality from export to growth. In long run, he observes inverse causality running from economic growth to exports.

Empirical evidence from the export-led growth hypothesis is mixed. Tingvall and Ljungwall (2012) use a multi-country meta-analysis, and conclude that exports have contributed to the growth of the PRC economy more than in other countries.

METHODOLOGY

During the last twenty years, Madagascar has experienced an increased growth except during the period of crisis when the country's productivity has decreased significantly. As we have seen in the previous chapter, the GDP per capita increased from -1.7% to 2.8% in 2004, but the growth of population has stagnated and trough the last 10 years foreign direct investment there were an increase of investment on mining area and free zone enterprise. These different indicators allow us to establish the econometric study of the case of Madagascar that we will try to run in this chapter.

Model specification

The model is based on the general production function of Solow where introduced that exports affect greatly the productivity of a country. GDP (Y) is represented as a function of capital (K), labor (L), the efficiency of work (A) and the externalities as export (X).

$Y = f(K, X, L)$

Human capital is included in the function, because as Lucas (1988) mentioned, it can be an alternative to the technological improvement and can lead a long-term growth, even in the absence of technological progress.

Barro and Sala-i-Martin (1995) also give importance to the work force, since the investment in education and human capital increases skills and enhances efficiency in production through the development of new technologies. As for the variable export, its introduction is due to the fact that the export sector has considerable influence on the non-export sector, which is the externality effect.

Data sources and variables

The data were obtained from the Central Bank, INSTAT and supplemented by data on the International Labor Organization website (ILO). The E-views software was used for all the results of the econometric study.

For the analysis of the case of Madagascar, annual time series were used for the period of 1983-2013. The variables of the model are the real GDP (Y) in billion of ariary, the stock of capital (K) in billion of ariary measured by gross fixed capital formation, the labor force (L) measured by the evolution of the total of population because there is no real data on labor force in Madagascar, the real exports (X) in billion of ariary.

Econometric approach

The co-integration allows us to determine whether there is a real relationship between the different variables in order to avoid spurious regression. Different steps are to be followed to achieve the co-integration. The first is to test the stationarity of series to determine if there is possibility of cointegration or not. The second shows that if the series are integrated of the same order then there is a possibility of co-integration. Therefore, one can consider the estimated VECM model.

For this, first we must determine the number of lags p, a model of VAR (p) by using information criteria (Akaike and Schwarz 1988). Then, there is the establishment of Johansen cointegration test to know the number of cointegration relationships. The fourth step is to identify the cointegrating relations or a long-term relationship between the variables. And finally is the estimation of the VECM model.

Test of stationarity

A process yt is stationary if the following conditions are satisfied:

1.E (yt) is independent of t

2. VAR (yt) is a finite constant independent of t

3. COV (yt, yt-1) is a finite function of k and does not depend on t.

When doing the regression by using the OLS the following model contain two stationary variables:

$yt = axt + b + \mathcal{E}t$

We get: $yt - axt - b = \mathcal{E}t \sim I\ (0)$

$\mathcal{E}t \sim I(0)$, $\mathcal{E}t$ is not stationary.

Generally, if xt and yt are series of $I(d)$, then in general, the linear combination $\mathcal{E}t = yt - axt - b$ is also $I(d)$. Furthermore, a performed regression is called misleading or illusory. It is characterized by R^2 and t Student very high while the two variables do not have connection between them.

To avoid this problem, we can perform the regression at first difference variables that are stationary ($\Delta yt = \alpha \Delta xt + \beta + \mu t$)

We will get: $\Delta yt - \alpha \Delta xt - \beta = \mu t \sim I\ (0)$

However, sometimes we want to study with variables at first differences. In this case, the cointegration method is needed. We have no spurious regression when the variables are cointegrated, that means when we have $yt - axt - b = \varepsilon t \sim I\ (0)$ while $yt \sim I(1) et\ xt \sim (1)$.

Increased Dickey-Fuller test

Increased Dickey-Fuller test considers the autocorrelation of errors by providing a representation $AR\ (p-1)$ for the error.

Then, hypothesis of the Dickey-Fuller test become:

Ho: non-stationary hypothesis, forms of non-stationary are:

$\Delta Xt = \rho X_{t-1} - \sum^{p}\ k = 2\ \ Y_k\, \Delta X_{t-k+1} + nt$ (1)

$\Delta Xt = \rho X_{t-1} - \sum^{p}\ k = 2\ \ Y_k\, \Delta X_{t-k+1} + C + nt$ (2)

$\Delta Xt = \rho X_{t-1} - \sum^{p}\ k = 2\ \ Y_k\, \Delta X_{t-k+1} + b_t\ + C + nt$ (3)

Where: $\rho = 0$, $\phi = 1$ and $nt \sim iid\ (0, \sigma_n^2)$

$H1 = |\phi_1| < 1$

The **p** value enabling to bleach the residues can be determined by using the partial correlogram of differentiated series ΔXt:

We will retain then the p value for the delayed number of p; the test sequence is identical to the simple test of the Dickey-Fuller. By adopting a structure asymptotic of test statistics that are similar to those obtained for the models of the Dickey-Fuller simple test. The critical values are identical for the increased and simple Dickey-Fuller test.

Cointegration test between several variables: The Johansen approach

Consider a vector Xt containing N variables $\sim I\ (1)$. The VAR (p) representation of X is:

$Xt = AtXt - 1 + \cdots + ApXt - p + \varepsilon t$, With $\varepsilon t \sim N\ (0; \Sigma)$

In our case, we have a VAR (2) composed by four variables $(Y_{1t}.K_{2t}.X_{3t}.I_{4t})$, With P=2 is coefficient of delay:

$$Y_t = A_1\ Y_{t=1} + A_2\ K_{t-2} + A_3\ X_{t-3} + A_4\ L_{t-4} + \mathcal{E}_t$$

$$\begin{matrix} Y_{1t} \\ K_{2t} \\ X_{2t} = \\ L_{2t} \end{matrix} \begin{matrix} a_{11}\ a_{12}\ a_{13}\ a_{14}\ Y_{1t-1} \\ a_{21}\ a_{22}\ a_{23}\ a_{24}\ K_{2t-1} \\ a_{31}\ a_{32}\ a_{33}\ a_{34}\ X_{3t-1} \\ a_{41}\ a_{42}\ a_{43}\ a_{44}\ L_{4t-1} \end{matrix} \begin{matrix} a_{11}a_{12}\ a_{13}a_{14} \\ a\ _{21}a_{22}\ a_{23}a_{24} \\ a_{31}a_{32}\ a_{33}a_{34} \\ a_{41}a_{42}\ a_{43}a_{44} \end{matrix} \begin{matrix} Y_{1t-2} \\ K_{2t-2} \\ X_{3t-2}\ + \\ L_{2t-2} \end{matrix} \begin{matrix} \mathcal{E}_{1t} \\ \mathcal{E}_{2t} \\ \mathcal{E}_{3t} \\ \mathcal{E}_{4t} \end{matrix}$$

Because we have the equation below:

$Y_{1t} = a_{11}Y_{1t-1} + a_{12}Y_{1t-1} + a_{13}Y_{1t-1} + a_{14}Y_{1t-1} + a_{15}Y_{1t-2} + a_{16}Y_{1t-2} + a_{17}Y_{1t-2} + a_{18}Y_{1t-2}$

$K_{2t} = a_{21}K_{2t-1} + a_{22}K_{2t-1} + a_{23}K_{2t-1} + a_{24}K_{2t-1} + a_{25}K_{2t-2} + a_{26}K_{2t-2} + a_{27}K_{2t-2} + a_{28}K_{2t-2}$

$X_{3t} = a_{31}X_{3t-1} + a_{32}X_{3t-1} + a_{33}X_{3t-1} + a_{34}X_{3t-1} + a_{35}X_{3t-2} + a_{36}X_{3t-2} + a_{37}X_{3t-2} + a_{38}X_{3t-2}$

$L_{4t} = a_{41}L_{4t-1} + a_{42}L_{4t-1} + a_{43}L_{4t-1} + a_{44}L_{4t-1} + a_{45}L_{4t-2} + a_{46}L_{4t-2} + a_{47}L_{4t-2} + a_{48}L_{4t-2}$

After determining the relationship equation of the different variables, we can rewrite the VAR (2) model as a VECM ("Vector Error Correction Model"). We write the VAR (2) model at first differences and according to $Xt - 1$ in adding the following words (in bold):

Yt – Yt-1 = A1Yt-1 – Yt-1 + A2Yt-2 + A2Yt-1 - A2Yt-1 + εt

ΔYt = (A1 - I) Yt-1 - A2 (Yt-1 – Yt-2) + A2Yt-1 + εt

ΔYt = -A2ΔYt-1 + (A1 + A2 - I) Yt-1 + εt

ΔYt = B1ΔYt-1 + ΔYt-1 + εt

Where B1 = -A2 and Δ = A1 + A2 - I.

Pose $\Pi_{(3;\ 3)} = \alpha_{(3;r)}\beta'_{(r;\ 3)}$ with β comprising the cointegrating vectors r (0<r<N) to highlight a VECM model. Suppose that r=2, then:

$$\begin{matrix} Y_{1t} \\ K_{2t} \\ X_{3t} \\ L_{4t} \end{matrix} \begin{matrix} b11b12b13b14 \\ b21b22b23b24 \\ b31b32b33b34 \\ b41b42b43b44 \end{matrix} \begin{matrix} \Delta Y_{1t-1} \\ \Delta K_{2t-1} \\ \Delta X_{3t-1} \\ \Delta Y_{1t-1} \end{matrix} \begin{matrix} \alpha11\alpha12 \\ \alpha21\alpha22 \\ \alpha21\alpha22 \\ \alpha41\alpha42 \end{matrix} \begin{matrix} \\ \delta11\delta12\delta13\delta14 \\ \delta11\delta12\delta13\delta14 \\ \end{matrix} \begin{matrix} Y_{1t-1}\ \varepsilon_t \\ K_{2t-1}\ \varepsilon_t \\ X_{3t-1}\ \varepsilon_t \\ L_{4t-1}\ \varepsilon_t \end{matrix}$$

In general, if we have the following representation VAR (p) for Yt:

$Y_{t(N;1)} = A_{1(N;N)}\ Y_{t(N;1)} + \cdots +\ A_{P(N.N)}L_{t-(N-1)}$, With $\varepsilon_t \sim N\ (0; \Sigma)$ and the VECM model will be written as follows:

$\Delta Y_t\ = B_1\ \Delta Y_{t-1}\ + \cdots + B_{p-1}\ \Delta L_{t-p+1}\ + \Pi Y_{t-1}\ + \varepsilon_t$

Where, $B_i = \Sigma^p\, j = 1 + i - Aj$ with $i = 1\ et\ \Pi = A1 + \cdots Ak - 1$

We pose $\Pi - \alpha\beta'\ with$ a matrix (N, r) with r <N contain the adjustment speeds for each cointegrating vectors β and the matrix (r, N) including r the cointegrating relationships. So, to estimate a VECM model, it is necessary that $R_g\ (\Pi) = R_g\ (\alpha\beta')$ which imply that Π is not zero at the r eigenvalues.

Johansen proposed the trace test to determine the **r** cointegrating relationships. This test is based on the null hypothesis that there is at most **r** cointegrating relationships (which means that there are non zero **r** eigenvalues and **N-r** zero eigenvalues):

$H_O\ : x_i\ = 0; i = r + 1; \ldots N$

The test statistic is:

$TR = -\mathrm{T}\Sigma^N\, i = r + 1\ log\ (1 - xi)$

The critical value of TR statistic were tabulated by Johansen and Juselius (1990); Osterwald-Lenum (1992); we accept H_0 when TR Statistical value is lower than its critical value.

EMPIRICAL RESULTS

When using time series, it is important to perform the process unit root test. To determine the cointegration of a series, we must go through several stages, first, we determine the stationarity of the process to be able to know the degree of integration of the series and lead to the phase of cointegration. Cointegration allows determining whether there is any relationship between the used variables.

The concept of stationarity should be checked for each series in order to avoid spurious regressions for which the results could be "significant", while they are not.

In addition, the unit root test reveals when the regression of ordinary least square (OLS) reached an adjusted $R^2$and a low value of Durbin-Watson. And to be able the to examine the presence of unit root, the test of Dickey-Fuller test (ADF) will be used.

Under the null hypothesis $H_0 : |\rho| \geq 1$, we are in presence of unit root with an integrated process (1) and under the alternative hypothesis $H_a\ = |\rho| \leq 1, \delta \nparallel 0, \beta \nparallel 0$, we are then in presence of a stationary process.

The tests were performed on the natural log and at first differences. The results obtained are shown in Table below. We can see in following the table that all level series are non-stationary, and with the differences, only four variables are stationary because the calculated values are less 5% than the critical value. But after another difference, all series are stationary.

As almost all variables are non-stationary to avoid a misleading study, we must precede the test of multivariate cointegration of Johansen to determine if there is a long-term relationship

between the variables. But to valid the test, the variables must integrated in the same order. In our case, all variables are integrated in order.

$[|\rho| > 1 \sim I(1); |\rho| < 1 \sim I(0)$, And each of them has a unit root.

Table 1. Result of the ADF unit root test

Test on level (offset 1 year)		
Variables	ADF	
Data (1983-2013)	Constant without trend	Constant with trend
GDP	3.21	2.41
GFCF	4.31	4.94
EXPORT	1.94	0.14
POPULATION	2.32	-1.87
Critical value		
1%	-3.64	-4.25
5%	-2.95	-3.55
10%	-2.61	-3.21
Test at first differences (offset 1 year)		
Variables	ADF	
Data (1983-2013)	Constant without trend	Constant with trend
GDP	-1.05	0.61
GFCF	2.29	3.21
EXPORT	-6.31*	-4.46
POPULATION	-3.12*	-2.66
1%	-3.64	-4.26
5%	-2.95	-3.55
10%	-2.65	-3.20

Johansen Cointegration Test

Before setting up the cointegration test, we must determine the delay number p of the VAR (p) model with Akaike and Schwarz criteria. For the VAR (1), the Akaike criterion is 254.1245 and the Schwarz criterion is 255.9910.

And for the VAR (2), the Akaike criterion is 248.9955 and 252.4971 for Schwarz, finally for the VAR (3), the criteria are 245.7453 and 250.9151.

So according to these criteria, we choose $\boldsymbol{p = 1}$ for the VAR model with variables in levels. For a cointegration relationship with a constant in the VAR model and the error correction model, we can see as follow the test result of the Trace and the eigenvalues:

Table 2. Trace test

Unrestricted Cointegration Rank Test (Trace)

Hypothesis d No. of CE (S)	Eigenvalue	Trace statistic	0.05 Critical value	Prob**
None*.	0.897	118.495	47.856	0.000
At most 1*.	0.547	41.121	29.797	0.001
At most 2	0.309	14.156	15.494	0.078
At most 3	0.045	1.570	3.841	0.210

Trace test indicates 2 cointegrating eqn(s) at 0.05 level

*denotes rejection of the hypothesis at 0.05 level

**MacKinnon of the hypothesis at 0.05 level

Table 3. Test of eigenvalues

Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesis d No. of CE (S)	Eigenvalue	Max Eigen statistic	0.05 Critical value	Prob**
None*.	0.897	77.374	27.584	0.000
At most 1*.	0.547	26.965	21.131	0.006
At most 2	0.309	12.585	14.264	0.090
At most 3	0.045	1.570	3.841	0.210

Trace test indicates 2 cointegrating eqn(s) at 0.05 level

*denotes rejection of the hypothesis at 0.05 level

**MacKinnon of the hypothesis at 0.05 level

According to these two tables, there are two cointegration relationships:

-There is cointegration because the null hypothesis of no cointegration was rejected for trace test and the eigenvalues (118.49> 47.85 and 77.37> 27.58).

-The null hypothesis according to which there is more than one cointegration relationship was accepted because we have 41.12> 29.79 and 26.96> 21.13 at the 5% threshold.

- The null hypothesis with more than two cointegrating relationships was rejected because 14.15 <15.49 and 12.58 <14.26 at the 5% threshold. So the tests show that there are two cointegrating relationships.

The estimated cointegration vector indicates a plausible coefficient and error correction for the variables except for gross fixed capital formation. (See annex)

$PIB = -5.35GFCF + 6.36EXPORT + 7.25POP$ (3)

This equation indicates that variables such as exports and population are positively correlated to economic growth with a respective estimated elasticity at 6.36 and 7.25. Oppositely, the GFCF from this result has a negative impact on economic growth, which is against the economic theories.

As we are facing a co-integration, we can use a model error correction:

$D(lnYt) = C + \alpha D\ (lnY_{t-1}) + \delta D(lnK_{t-1}) + \delta D(lnX_{t-1}) + \theta D(lnL_{t-1})$ Where, D is an operator of delay.

Regression Results

The estimation of this model using the data from 1983 to 2013 by ordinary least squares gives the following results:

Table 4. Regression Results

	Short run	Long run
Effect of 1% increase of labor on GDP	0.44%	Not significant
Effect of 1% increase of investment on GDP	0.17%	Not significant
Effect of 1% increase of exports on GDP	0.79%	0.46%

DISCUSSION

Impact of investment on growth

The model shows that in the short term, investment has a positive and significant impact on growth: when the investments grow by 1% GDP grows 0.17%. This result demonstrates that investments have always been an engine of growth.

However, the model shows that, in long term, investments do not have a significant impact on growth in Madagascar: this may be due to the fact that more of the investments is public investments which is situated in the social areas that are not directly productive.

UNCTAD 2006 reports on LDCs that Madagascar is among the countries with a growth regression during the last five years; 5% of GDP represent the public investment, 4.5% on the private investment and 1.5% of GDP on the foreign direct investment.

According to Dollar and Aart Kraay by their studies, they concluded that an increase in the share of trade in GDP from 20% to 40% over 10 years would increase real GDP per capita by 10%, so GDP growth 1% per year. Madagascar will therefore try to reach the 20% for ten years; so really, we want to see growth fuelled by exports.

Impact of labor on growth

According to the model, short-term labor has a significant impact on growth: 1% increase of the workforce indicates that 0.44% (or 59,325 workers) of the population keeps the growth. This is contrary to the long-term relationship because it has no significant impact on growth. 80% of the population in Madagascar is farmers working in the agricultural sector, so the fact that there is no long-term relationship between labor and growth situated the fact that only, on average, 6.65% of the population is highly qualified.

Impact of exports on growth

The model shows both in the short and long term that exports have a significant and positive impact on GDP growth. In the short term, 1% increase of exports leads to an increase of 0.79% of GDP. Even in the short term, the effect of exports is still higher than that of investments ($R_2 = 0:91$). Similarly, in the long term 1% increase of exports gives 0.46% growth of GDP. This result goes in the same direction as the predicted theoretical analyzes on the effect of trade liberalization ($R_2 = 0:99$).

Confronting results with theoretical work

Impact of exports

We have seen previously that exports have a significant impact on economic growth, but they are lower because our trade balance is still in deficit. During the past decade, Madagascar has seen its export ratio per GDP increased, thanks to the enlargements of exportable products.

The years 1990 to 2000, Madagascar exported only the basic commodities, and from mid 2000 that the government decided to hand over the problem and encourage the establishment of Export Processing Zone (EPZ) and privatization of public enterprises.

After the basic products, thanks to the EPZs, the Big Island exports textile and clothing products that is increasing the value added of the country. But those actions are still insufficient, the country need to expand exportable products, for that the comparative theory of Ricardo can be used and Madagascar may try to produce at least semi-finished products which will increase the value chain and the added value of products exported from the country. Like that, Madagascar can expect a favorable economic growth

Impact of investments

Investment is a powerful creator of income and employment; it is one of the main drivers of growth. But for the case of Madagascar, according to the econometric study investment has a short-term impact. Most EPZs located in Madagascar uses unskilled labor with low wages, which does not contribute sufficiently to economic growth. This is quite contrary to the economic theories of the investment weight on national income. Apart from this non-qualification, the repeated political crises also do not encourage the foreign investors. That is allowing us to say that it is for the governments to establish a favorable economic and political environment so that investment will become real engines of growth.

Impact of the labor force

Economic activity is the act of the labor force. It is, on economic term, a factor of production absolutely complementary and inseparable of capital factor. Approximately 40% of the Malagasy populations represent the working population, and more than 70% are unskilled peasants. The labor force can have a long-term impact on Malagasy economic growth by taking as example the case of few Asian countries like India, Indonesia and especially China by training people on profitable business areas, which include the new technology. Thus, the Malagasy economy may justify the endogenous growth theory.

In total then, the idea that the growth of export is a key factor of economic growth, the hypothesis that the export results in economic growth generated a lot of research. For Madagascar, the long-term relationship between the variables was not consistent with theoretical theories because only exports and labor are positively related to GDP except for investment. But the econometric study demonstrates clearly a significant effect for growth. For that, the government will have to consider an outward oriented policy with high added value products if Madagascar wants a growth driven by exports.

Through this part, the theory that exports can lead to economic growth is true for the case of Madagascar. Although the Big Island is among the poorest countries in the world, it can expect from an outward oriented policy through export a significant or positive response to the economic growth. But that depends on certain conditions, such as finding a new market monitoring by an international standards. This section allowed knowing that the export is not the only engine of growth, it also added investment and also as engine of growth. And to maintain a continuation of long-term growth; a reorientation of economic policies is required.

So the government can effectively lean towards a policy to improve the export sector, because as Madagascar has natural resources, exploitation of the mining sector will help to boost its economic growth.

CONCLUSION

The purpose of this study was to determine the applicability of the hypothesis that the export may boost economic growth for the case of Madagascar between 1983 and 2013. Between 1988 and 1990, Madagascar went under the structural adjustment program after the two oil crises thereby increasing the problems of imbalance in the balance of payments. A program under the aegis of the International Monetary Fund with the aim of achieving self-sustaining growth, but imports rising faster than exports, widening increasingly the external imbalance and increasing debt.

In this work, we tried to empirically analyze the export effect on economic growth in Madagascar. Tests have shown that there is at least one cointegration relationship between the variables except for investments. This work also used the VAR model and impulse response function (IRF) to determine system responses to the economic shocks of exports. The result showed that the impact of the export on GDP has a positive and significant impact (short-term impact is of 0.79% on GDP and long term it is 0.46%).

Our analysis shows that exports of goods remain an important source of economic growth, despite the fact that Madagascar is dependent on raw materials, equipment and imported materials. Therefore, government policy should encourage private sector investment; promote the export of non-traditional products, which are important to stimulate exports, it is also important to ensure that the goods produced can compete internationally in terms of quality and price. The relationship between exports and economic growth shows that economic reform policies and access to global markets will help the economy to reallocate productive resources used. But despite this, there are still adjustments including greater liberalization of trade, a revision of tariffs, non-tariff barriers, and exchange rate policy and infrastructure construction.

But the reality is different in Madagascar, the Big Island is rich in natural resources, whether agricultural, mining or due to its flora and fauna. However, it is among the poorest countries. Among the reasons for this poverty are lack of access to international markets for raw materials and non-profitability of the exploitation of these resources. The main solutions proposed by an economist is to enjoy the positive externalities such as human capital, economies of scale on the accumulative factors (Romer 1986) and focus on the overall productivity of endogenous factors and depending on which private is to give importance to the efficiency of economic organization such as the market mechanism and incentives to innovate.

Our study affirms the conclusion that although theorists have said that exports have a positive influence on economic growth of a country. In the case of Madagascar, both short and long term, exports have a positive effect on growth, but what we can see; the impact is minimal because although exports are growing GDP, the growth meanwhile is still in decline for the past

10 years. Seen that the Big Island still runs through repeated political crises then it is clear that growth cannot recover. In this research, it was found that the export is not the only one to have influence on economic growth. Investments and the labor force also play important roles in the maintenance of economic growth. Exports contribute more to the people of Madagascar to the Malagasy economy since the first affected will be producers, and even more by expanding the products, this will reduce the high unemployment rate in Madagascar.

LIMITATIONS OF STUDY

There are few limitations associated to this study, it should be highlighted that due the limitations on data availability, not all the related variables were included in the models. For example The FDI –led growth hypothesis confirms that FDI can be used as variable for this study but due to the political instability in the country that variable was not taken. In addition, the fact that Madagascar is defined by different characteristics may limit the generalizability of our findings. For this reasons, in order to offset these limitations, a comparison with the existing literature for Madagascar is needed.

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