

Export - led Growth or Growth - Driven Exports? Evidence from Nigeria

Santos R. Alimi^{1*}, Bernard O. Awomuse²

¹ Department of Economics, Adekunle Ajasin University Akunbga Akoko, Ondo State Nigeria

² Department of Mathematics and Statistics, Rufus Giwa Polytechnics, Owo, Ondo State, Nigeria.

ABSTRACT

Aims: This paper examined the role of export in the economic growth process in Nigeria

Study design: Case Study

Place and Duration of Study: Nigeria. Time series data ranging from 1970 to 2009.

Methodology: The study employs unit root testing, co-integration analysis, Ordinary Least Squares (OLS) regression, Error Correction Model (VECM) and VAR Granger Causality/Exogeneity Wald Tests to analyze annual time series data from Nigeria. The study uses three measures of export namely, Total export, Oil export and Non-Oil export. This enhances the stability and robustness of results.

Results: the unit root test showed that both economic growth and export are integrated of order one, i.e. 1(1). The cointegration test confirmed that economic growth and export are cointegrated, indicating an existence of long run equilibrium relationship between the two as confirmed by the Johansen cointegration test results. Granger causality was applied to test the causal relationship between GDP and economic growth. The results show that there is evidence of bi-directional causality between export and economic growth in Nigeria in cases where total exports and oil exports are used to capture Nigeria export. Nevertheless, there is an evidence of uni-directional causality between export and economic growth when non-oil export for Nigeria is used and the direction of causality runs strictly from export to economic growth.

Conclusion: Since the non-oil contribution to Nigeria exports and GDP is insignificant (less than 10%), this study concluded confirm the evidence of bi-directional causality between export and economic, which implies that both exports and economic growth are influenced by each other.

Keywords: Exports, Growth, Granger Causality, Cointegration, Nigeria

1. INTRODUCTION

Export-led growth is a development strategy aimed at growing productive capacity by focusing on international markets. The export-led growth hypothesis is part of consensus among economists about the gains of economic openness that took hold in the 1970s, which rests on a fusion of three lines of argument; the first, based on Heckscher–Ohlin–Samuelson comparative advantage theory, is about the benefits from trade between countries with different capital–labor ratios, second concerns the benefits of openness for controlling rent seeking and the third which was developed later, concerns the benefits of openness for

* Tel.: +234 806 255 3530.

E-mail address: santos4rd@gmail.com

growth. The claim is trade encourages technology diffusion and knowledge spillovers that contribute to faster productivity growth (Palley, 2011).

The export-led growth hypothesis (ELGH) postulates that export expansion is one of the main determinants of growth. Many developing countries like Nigeria pursued import-substitution strategy for growth and development but with the spectacular success story of the four East Asian Tiger economies (South Korea, Hong Kong, Taiwan and Singapore) and the Latino-American countries like Mexico and Brazil over the past three decades, appeared to provide empirical support for export-led growth hypothesis (ELGH). A significant amount of research has been conducted in developed countries and emerging economies to prove and establish this hypothesis. Giles and Williams (2000) reviewed over one hundred and fifty export-growth applied papers published between 1963 and 1999. Among most recent, and most comprehensive survey of this literature are; Panas and Vamvoukas (2002), Jordan and Eita (2007), Abou-Stait, F. (2005), Abual-Foul, B. (2004), Awokuse, T.O. (2004), Yang (2008), Yao, S. and Zhang, Z. (2000), Alam (2011) and Maneschiold (2008). But few studies have been conducted in Nigeria to validate this important hypothesis, among which are; Omisakin (2009) and Chimobi (2010). The early works in this area adopted a cross-sectional framework and a country specific time-series studies, adopting both bivariate and multivariate models to test the validity of the ELG hypothesis; however, the empirical evidence based on those studies is mixed and often contradictory. In part, differences in the measures of exports used, the sampling period, and methodologies adopted explain the mixed results.

The purpose of this paper is to analyze the causality between exports and economic growth of Nigeria and to evaluate the relationship of these variables for the period 1970 to 2010. Granger causality econometric techniques will be applied to test the hypothesis of an export-led growth strategy. It tests whether export Granger causes economic growth, or whether the causality runs from economic growth to exports, or if there is bi-directional causality between exports and economic growth. The results of this paper will help to evaluate the effectiveness of Nigeria's strategy of growth led by exports. The paper is organized as follows. Section two describes the methodology and data while section three presents the empirical results and section four concludes.

2. MATERIAL AND METHODS

2.1 Granger causality test

The Granger causality test was developed by Granger (1969), and according to him, a variable (in this case export) is said to Granger cause another variable (GDP) if past and present values of export help to predict GDP. To test whether exports Granger cause GDP, this paper applies the causality test developed by Granger (1969). A simple Granger causality test involving two variables, exports and GDP is written as:

$$EXPORT_t = \sum_{j=1}^p \alpha_j Export_{t-j} + \sum_{j=1}^p \beta_j GDP_{t-j} + \mu \quad (1)$$

$$GDP_t = \sum_{j=1}^p \eta_j Export_{t-j} + \sum_{j=1}^p \gamma_j GDP_{t-j} + \gamma \quad (2)$$

The null hypotheses to be tested are:

H₁: $\eta_j = 0$: $j=1, \dots, p$, this hypothesis mean that export does not Granger cause GDP.

H₂: $\beta_j = 0$: $j=1, \dots, p$, this hypothesis means that GDP does not Granger cause exports.

If none of the hypotheses are rejected, it means that export does not Granger cause GDP and GDP also does not Granger cause exports. It indicates that the two variables are independent of each other. If the first hypothesis is rejected, it shows that exports Granger causes GDP. Rejection of the second hypothesis means that the causality runs from GDP to

exports. If all hypotheses are rejected, there is bi-directional causality between exports and GDP. We re-specify equation (1) as well as (2) and estimate the 3 variants of the export-growth model as;

Model 1

$$\text{EXPORTtotal}_t = \theta + \delta \text{GDP}_t + u_t \quad (3)$$

$$\text{GDP}_t = \lambda + \eta \text{EXPORTtotal}_t + \mu_t \quad (4)$$

Model 2

$$\text{EXPORToil}_t = \theta + \delta \text{GDP}_t + u_t \quad (5)$$

$$\text{GDP}_t = \lambda + \eta \text{EXPORToil}_t + \mu_t \quad (6)$$

Model 3

$$\text{EXPORTNoil}_t = \theta + \delta \text{GDP}_t + u_t \quad (7)$$

$$\text{GDP}_t = \lambda + \eta \text{EXPORTNoil}_t + \mu_t \quad (8)$$

Where EXPORTtotal is sum of all Nigerian export, EXPORToil is total oil export, EXPORTNoil is sum of non-oil export and GDP is gross domestic products, used as a proxy for economic growth.

We start this analysis by first examining the stationarity of our variables, nominal interest rate and expected inflation. A non-stationary time series has a different mean at different points in time, and its variance increases with the sample size (Harris and Sollis (2003). A characteristic of non-stationary time series is very crucial in the sense that the linear combinations of these time series make spurious regression. In the case of spurious regression, t-values of the coefficients are highly significant, coefficient of determination (R²) is very close to one and the Durbin Watson (DW) statistic value is very low, which often lead investigators to commit a high frequency of Type 1 errors (Granger and Newbold, 1974). In that case, the results of the estimation of the coefficient became biased. Therefore it is necessary to detect the existence of stationarity or non-stationarity in the series to avoid spurious regression. For this, the unit root tests are conducted using the Augmented Dickey-Fuller (ADF) test and Philips-Perron (PP). If a unit root is detected for more than one variable, we further conduct the test for cointegration to determine whether we should use Error Correction Mechanism.

2.2 Cointegration Analysis

Cointegration can be defined simply as the long-term, or equilibrium, relationship between two series. This makes cointegration an ideal analysis technique to validate the export led growth hypothesis (ELGH): by ascertaining the existence of a long-term relationship between economic growth and export. The Vector Autoregression (VAR) based cointegration test methodology developed by Johansen (1991; 1995) is described as follows;

The procedure is based on a VAR of order p:

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + B z_t + \varepsilon_t \quad (9)$$

where y_t is a vector of non-stationary I(1) variables (interest rate and expected inflation), z_t is a vector of deterministic variables and ε_t is a vector of innovations. The VAR may therefore be reformulated as:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + B z_t + \varepsilon_t \quad (10)$$

$$\text{Where } \Pi = \sum_{i=1}^p A_i - I \quad (11)$$

$$\text{and } \Gamma_i = \sum_{j=i+1}^p A_j \quad (12)$$

Estimates of Γ_i contain information on the short-run adjustments, while estimates of Π contain information on the long-run adjustments, in changes in y_t . The number of linearly dependent cointegrating vectors that exist in the system is referred to as the cointegrating

rank of the system. This cointegrating rank may range from 1 to $n-1$ (Greene 2000:791). There are three possible cases in which $\Pi y_{t-1} \sim I(0)$ will hold. Firstly, if all the variables in y_t are $I(0)$, this means that the coefficient matrix Π has $r=n$ linearly independent columns and is referred to as full rank. The rank of Π could alternatively be zero: this would imply that there are no cointegrating relationships. The most common case is that the matrix Π has a reduced rank and there are $r < (n-1)$ cointegrating vectors present in β . This particular case can be represented by:

$$\Pi = \alpha\beta' \quad (13)$$

where α and β are matrices with dimensions $n \times r$ and each column of matrix α contains coefficients that represent the speed of adjustment to disequilibrium, while matrix β contains the long-run coefficients of the cointegrating relationships.

In this case, testing for cointegration entails testing how many linearly independent columns there are in Π , effectively testing for the rank of Matrix Π (Harris, 1995:78-79). If we solve the eigenvalue specification of Johansen (1991), we obtain estimates of the eigenvalues $\lambda_1 > \dots > \lambda_r > 0$ and the associated eigenvectors $\beta = (v_1, \dots, v_r)$. The co-integrating rank, r , can be formally tested with two statistics. The first is the maximum eigenvalue test given as:

$$\lambda\text{-max} = -T \ln(1 - \lambda_{r+1}), \quad (14)$$

Where the appropriate null is $r = g$ cointegrating vectors against the alternative that $r \leq g+1$. The second statistic is the trace test and is computed as:

$$\lambda\text{-trace} = -T \sum_{i=r+1}^n \ln(1 - \lambda_i), \quad (15)$$

where the null being tested is $r = g$ against the more general alternative $r \leq n$. The distribution of these tests is a mixture of functional of Brownian motions that are calculated via numerical simulation by Johansen and Juselius (1990) and Osterwald-Lenum (1992). Cheung and Lai (1993) use Monte Carlo methods to investigate the small sample properties of Johansen's λ -max and λ -trace statistics. In general, they find that both the λ -max and λ -trace statistics are sensitive to under parameterization of the lag length although they are not so to over parameterization. They suggest that Akaike Information Criterion (AIC) or Schwarz Bayesian Criterion (SBC) can be useful in determining the correct lag length.

The empirical analysis was presented by time series model. The study uses long and up-to-date annual time-series data (1970-2009), with a total of 40 observations for each variable. The data for the study are obtained from Central Bank of Nigeria Statistical Bulletin and Annual Report and Statements of Account for different years. We employ ordinary least square (OLS) method. All the variables are in logarithm form and the software application utilized is E-views 7.0.

3. RESULTS AND DISCUSSION

3.1 Unit root test

Tables 1 therefore provide the results of the unit root tests both with and without trend.

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In other words, a long-run stable relationship between export and economic growth (GDP) exists irrespective of the measurement of export used. This implies that export and economic growth move together in the long run. Since the existence of a long-run relationship has been established, the short-run dynamics of the model can be established within an error correction model.

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221 3.3 Long Run OLS Results

222 Using OLS with the HAC or Newey-West standard error that takes into account the
223 autocorrelation, we presented the estimated results in Table 3.

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225 **Table 3: Result of OLS Technique for Model 1-3**

Model	Dependent Variable	C	Coefficient of Independent Variable	R2	DW
1	EXPORTtotal	-1.840875 [0.0000]	1.097139 [0.0000]	0.992618	1.185849
	GDP	1.708847 [0.0000]	0.904733 [0.0000]	0.992618	1.172543
2	EXPORToil	-2.026077 [0.0000]	1.117260[0.0000]	0.992083	1.191691
	GDP	1.845568[0.0000]	0.887961[0000]	0.992083	1.177129
3	EXPORTNoil	-3.698481[0.0000]	0.870932[0.0000]	0.945715	0.442420
	GDP	4.334820[0.0000]	1.085866[0.0000]	0.945715	0.418738

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227 **[] P-Value**
228 The results reported in Table 3 shows that exports and economic growth are positively
229 related in the three models. The estimated elasticities of exports in model 1, model 2 and
230 model 3 are 0.904733, 0.887961 and 1.085866 respectively. The implication of this is that a
231 1% increase in exports in model 1 (model 3) will lead to about 0.91% (1.09%) increase in
232 economic growth. Whereas, estimated elasticities of growth, proxy by GDP in model 1 and
233 model 3 are 1.097139 and 0.870932 respectively. Suppose that GDP increases by 1%, this
234 will lead to about 1.1% rise in total export (in model 1) and 0.87% increase in non-oil export
(in model 3).

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236 3.4 Granger Causality Test

237 The next step is to test for the direction of causality between export and economic growth
238 using VAR Granger Causality/Exogeneity Wald Tests. In table 4, causality result is
239 presented.

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257 **Table 4: VAR Granger Causality/Exogeneity Wald Tests**

Direction of Causality	Df	χ^2	Prob.	Decision
Model 1				
GDP does not Granger Cause EXPORTtotal	2	8.457621	0.0146	Bi-directional causality EXPORTtotal↔ GDP
EXPORTtotal does not Granger Cause GDP	2	24.19668	0.000	
Model 2				
GDP Granger does not Cause EXPORToil	2	8.189925	0.0167	Bi-directional causality EXPORToil↔ GDP
EXPORToil does not Granger Cause GDP	2	23.86490	0.0000	
Model 3				
GDP does not Granger Cause EXPORTnoil	2	1.307700	0.5200	Unidirectional Causality EXPORTnoil→GDP
EXPORTnoil does not Granger Cause GDP	2	42.24674	0.0000	

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259 For model 3, a chi-square test statistics of 42.24674 for economic growth (GDP) with
260 reference to exports (EXPORTnoil) represents the hypothesis that lagged coefficient of GDP
261 in the regression equation of EXPORTnoil is equal to zero. Thus, non-oil exports granger
262 causes economic growth at 0.01 level of significance. However, for GDP equation, null
263 hypothesis cannot be rejected. This suggests that GDP does not granger cause non-oil
264 exports, providing therefore, an evidence of uni-directional causality between non-oil exports
265 and economic growth and causality run strictly from non-oil export to economic growth i.e
266 economic growth respond to the movements in non-oil exports.

267 The results of model 1 and model 2 are similar, the hypothesis that total export (oil
268 export) does not Granger causes GDP is rejected and the hypothesis that GDP does not
269 Granger causes total export (oil export) is also rejected. These results provide evidence of
270 bi-directional causality between total export (oil export) and GDP. Bi-directional causality
271 found in model 1 and model 2 is not surprising because oil which is the main export product
272 of Nigeria is also the main contributor to GDP and government revenue. These results
273 provide evidence in support of the export-led growth hypothesis and as well as the existence
274 of reverse causality.

275 3.5 Error Correction Mechanism (VECM):

276 Finally, in order to check the stability of the model, we estimated the vector error correction
277 model (VECM). The results of VECM are presented in Table 5.

278 Table 5: Result of VECM

Variable	MODEL 1		MODEL 2		MODEL3	
	D(GDP)	D(EXPORTtotal)	D(GDP)	D(EXPORToil)	D(GDP)	D(EXPORTnoil)
C	238.7346 (67.9635) [3.51269]	126.2056 (84.1434) [1.49989]	247.492 (68.1409) [3.63584]	135.0155 (85.1792) [1.58508]	779.7769 (227.801) [3.42306]	-14.81101 (3.21279) [-4.61001]
ECM(-1)	-4.015224 (0.77487) [-5.18179]	-4.810250 (0.62587) [-7.68568]	1.953829 (0.25198) [7.75379]	1.652133 (0.31499) [5.24501]	-1.011245 (0.31117) [-3.24982]	0.023937 (0.00439) [5.45430]
R2 S.E of equation F-statistics	0.930941 338.6227 53.92110	0.677313 419.2380 8.395906	0.930988 338.5072 53.96064	0.670384 423.1496 8.135347	0.823478 541.3826 18.66003	0.867330 7.635373 26.15007

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282 The results indicate that the error correction term for Growth and Export equations in model
283 1 is statistically significant at 5 percent significant level with right sign (negatively signed). It

indicates about 4.1 percent speed of convergence towards equilibrium position in case of any disequilibrium situation. Whereas, for model 2, the error correction term is statistically significant at 5 percent significant level with positive sign. The model suggested that about 2 percent for growth equation and 1.7 percent for export equation, of the disequilibrium is corrected within the year. Finally, with model 3, the error correction term in growth equation is correctly signed but not export equation and it showed slow speed of adjustment to equilibrium.

4. CONCLUSION

This paper has examined the role of export in the economic growth process in Nigeria using b causality tests within an error-correction framework for data over the period 1970 to 2009. The unit root properties of the data were examined using the Augmented Dickey Fuller test (ADF) and Phillip Perron (PP) after which the cointegration and causality tests were conducted. The error correction models were also estimated in order to examine the short – run dynamics.

The major findings include the following; the unit root test clarified that both economic growth and export are integrated of order one, i.e. 1(1). The cointegration test confirmed that economic growth and export are cointegrated, indicating an existence of long run equilibrium relationship between the two as confirmed by the Johansen cointegration test results. Granger causality was applied to test the causal relationship between GDP and economic growth. The results show that there is evidence of bi-directional causality between export and economic growth in Nigeria in cases where total exports and oil exports are used to capture Nigeria export. Nevertheless, there is an evidence of uni-directional causality between export and economic growth when non-oil export for Nigeria is used and the direction of causality runs strictly from export to economic growth. The results are favourably comparable to those obtained in the literature such as Omisakin (2009) but at variance with Udah (2012) which found no causality between export and growth for Nigeria.

In conclusion, since the non-oil contribution to Nigeria exports is insignificant (about 10%), this study supports the presence of bi-directional causality in case of Nigeria, that is causality runs from export to economic growth and vice-versa. Nigeria can therefore expand its market by exporting more products to the international markets and focus policies on export promotion in order to fabricate export capacity to enhance economic growth. On the other hand, the results also suggest that export in Nigeria can be further raised by increasing economic growth. Thus, research and development (R&D) should be encouraged to get the required technology and emphasis should be geared to establish and develop adequate infrastructure particularly in the power generation and distribution and enhanced institutions to check corruption as these will enhance economic growth.

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COMPETING INTERESTS

The author declares that no competing interests exist.

AUTHORS' CONTRIBUTIONS

The lead author designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. The co-author managed the analyses of the study while both authors read and approved the final manuscript."

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