Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.8, No.14, 2017

Cointegration and Causality between Exports and Economic Growth: Evidence from Nigeria

Mukhtar Wakil Lawan
Department of Economics, Modibbo Adama University of Technology, Yola, Adamawa State, Nigeria

Abstract
The study examines the long run link between export components of oil, non-oil sector and economic growth in Nigeria for the period 1981 - 2015. The empirical analysis is based on Johansen's cointegration technique to establish the long run relationship, and Granger causality test within a vector autoregressive framework to determine the direction and short run causality. The results support the growth-led export hypothesis in the long run and export-led growth hypothesis in the short run. Hence, the study recommends that current macroeconomic policies aimed at promoting investment in the non-oil sector should be expanded, and profit based market incentives should be increased to encourage more active labour participation in the non-oil sector of the Nigerian economy.
Keywords: Cointegration, Causality, Exports, Economic growth, VAR

1. Introduction
The export-led growth (ELG) hypothesis which attributes strong economic growth to high export performance has generated a lot of interest among different experts and policy makers due to its significance in helping to determine and set economic strategies needed to sustain growth and development especially in developing economies. Some studies (Ahmad & Harnhirun, 1996; Plümper & Graff, 2001; Sulaiman & Saad, 2009) suggested that the relative above average economic growth recorded by notable East Asian economies popularly called Asian tigers, and some Latin American countries motivated economists and experts alike to investigate the relationship and pattern of causality between export and economic growth. Most of these countries heavily specialised in the production and export of consumer goods post world war II.

Most of the empirical studies for Nigeria have focused on the relationship between aggregate exports and economic growth, thereby leaving a literature gap on the causal inference between economic output and exports components of oil and non-oil sector. Although Nigeria largely depends on the revenue from the oil sector, it has been implementing policies in recent years in order to promote diversification into the non-oil sector particularly agriculture and manufacturing. This is in response to declining global oil demand partly driven by the objectives to utilise alternative and cleaner sources of energy. Hence, an in-depth understanding of the relationship and direction of causality between these macroeconomic variables has a significant implication for policy making in Nigeria. This paper seeks to re-examine the ELG hypothesis for the case of Nigeria by analysing the dynamic relationship between economic growth, oil export, non-oil export, imports, capital, labour and foreign reserve.

2. An Overview of the Empirical Literature
The classical economic theory of comparative advantage highlights an important basis for beneficial trade when a country specialises in the production of commodities over which it has relative comparative advantage. The neoclassical trade theory expanded on the transmission mechanism suggesting that trade increases economic growth when it raises export earnings and capital formation. Trade helps to enhance capacity utilisation, and leads to productivity gains due to economics of scale when producing at a large scale for the international market (Deme, 2002; Doraisami, 1996; Mahadevan, 2009; Ozturk & Acaravci, 2010). Moreover, trade can improve economic efficiency due to transfer of technological knowledge, ideas and skills which contribute in making domestic products more competitive. It helps to provide the foreign exchange needed to import vital raw materials and capital goods employed for domestic production. However, a supportive policy environment, macroeconomic stability, adequate human and capital investment is needed to sustain a high export performance.

The results of the numerous empirical studies on the relationship and direction of causality between exports and economic growth has been mixed of which some results support either the export-led growth (ELG) or growth-led export (GLE) hypothesis. Some studies (Awokuse, 2003; Bahmani-Oskooee & Alse, 1993; Ewetan & Okodua, 2013; Jin & Eden, 1995; Moschos, 1989; Ronald & Weaver, 1993) have suggested that non-convergence in empirical results is due to differences in methodologies, data frequency, time periods, variables employed, country economic characteristics, foreign policy and theoretical framework.

The first category of studies (Balassa, 1978; Bhagwati, 1978; Heller & Porter, 1978; Kravis, 1970; Singer & Gray, 1988) mostly used cross-sectional or panel data to establish evidence in support of the export-led growth (ELG) hypothesis for some countries. Moreover, most of the studies relied on the use of bivariate correlation to establish the relationship between export and economic output, and they did not consider the direction of causality. A notable criticism of these studies was on the use of high correlation to imply causation between exports and economic output even though regression does not imply causation. Bahmani-Oskooee & Economidou (2009) suggested that such studies also fail to capture country specific attributes due to the cross-sectional data features.

The second category of studies used cross-sectional and time-series data, and employed OLS estimation techniques to establish the relationship between export and economic growth. However, the first subset of past studies (Fosu, 1990, 1996; Greenaway & Sapsford, 1994; Kavoussi, 1984; Krueger, 1978; Moschos, 1989; Ram, 1985, 1987; Salvatore & Hatcher, 1991; Tyler, 1981; Ukpolo, 1994; Voivodas, 1973; Williamson, 1978) did not account for the direction of causality, and was subjected to criticisms due to the use of non-stationary data which could lead to spurious regression. The other subset of past studies (Ahmad & Kwan, 1991; Bahmani-Oskooee, Mohtadi, & Shabsigh, 1991; Chow, 1987; Holman & Graves, 1995; Jin & Eden, 1995; Jung & Marshall, 1985; Love, 1994; Serletis, 1992) applied either Sims' (1972) or Granger's (1969) causality test on time-series data to draw inference on causality patterns. The main criticism of these subsets was that they fail to account for the cointegration properties between export and economic output. Engle and Granger (1987) have suggested that causality between economic variables should be tested on the basis of an error correction model (ECM) if they share a common trend or are cointegrated in order to obtain better statistical inference on causality.

As a result, the third category of studies (Ahmad & Harnhirun, 1996; Bahmani-Oskooee & Alse, 1993; Deme, 2002; Henriques & Sadorsky, 1996; Islam, 1998; Kaushik & Klein, 2008; Kugler & Dridi, 1993; Mahadevan, 2009; Marin, 1992; Onafowora, Owoye, & Nyatepe-Coo, 1996; Oxley, 1993; Sulaiman & Saad, 2009; Van den Berg & Schmidt, 1994; Xu, 1996; Zestos & Tao, 2002) applied cointegration and error correction models in their analysis of causality between exports and economic growth in order to overcome some of the short-comings of the first and second category of studies.

Among some of the studies for Nigeria, Idowu (2005) applied Johansen cointegration and traditional Granger causality test. The results suggested that export and economic growth are cointegrated, and indicated bidirectional causality. However, the study did not test causality using an error correction model (ECM). Similarly, Ewetan & Okodua (2013) using Johansen cointegration and Granger causality test found model variables of GDP, exports and imports cointegrated, but found unidirectional causal pattern in support of the growth-led export (GLE) hypothesis for Nigeria. However, causal direction was not tested using an ECM model.

Odusola and Akinlo (1995) applied traditional Granger causality to validate the export-led growth (ELG) hypothesis for Nigeria. The results found bidirectional causality between economic growth and exports in support of both the growth-led exports and exports-led growth hypothesis. However, the study did not account for possible cointegration properties of model variables.

Deme (2002) used quarterly time series data (1970-1997) for variables of GDP, imports and exports. The study applied Johansen cointegration and tested causality within a vector autoregressive (VAR) framework. The study found no long run relationship between trade openness and economic growth in Nigeria. It concluded that the positive relationship between trade openness and economic growth is based on short term causal links. Likewise, Uche (2009) tested the ELG hypothesis for Nigeria using export components of oil and non-oil sector. The results suggested unidirectional causality from oil export to economic growth, and non-oil sector does not Granger cause economic growth. Nonetheless, both studies by Deme (2002) and Uche (2009) could benefit from an extended data period especially because the Nigerian government had adopted policies in periods not captured by these studies in an attempt to diversify the economy by promoting investment and production in non-oil exports.

In a recent study, Ugochukwu and Chinyere (2013) tested the ELG hypothesis for Nigeria using annual time series data (1986-2011). The variables employed included GDP, oil export, non-oil export and foreign reserve. The results found a significant positive relationship between GDP and all independent variables, but the causal pattern supported the GLE hypothesis. However, similar to some empirical studies, the study did not include imports in the model specification. Reizman, Summers and Whiteman (1996) suggested the inclusion of an import variable in empirical models in order to avoid getting spurious causal results. They also attributed no cointegration findings between export and economic growth in most studies to the likely omission of import variable. The study also did not include cointegration test to account for possible long run relationship between GDP and export components of oil and non-oil sector.

The aforementioned discussions for most of the previous country specific studies for Nigeria which used time-series data either focused on the relationship between aggregate exports and economic output, omitted some important relevant variables or tested causality without accounting for the cointegration properties of model variables. Hence, this study will re-examine the ELG hypothesis for Nigeria using export components of oil and non-oil sector. Additional relevant variables of import, capital, labour and foreign reserve are included in the econometric model. An Error correction model will be used if the variables exhibit cointegration properties in order to draw better statistical inference on causality pattern.

3. Data and Methodology

The empirical analysis for the study utilised 1981 – 2015 annual time series data obtained from the Central Bank of Nigeria (CBN) 2015 issue of statistical bulletin, and the World Bank Group. The dependent variable of economic growth is measured by real gross domestic product (RGDP) in constant 2010 U.S dollars while the independent variable of capital is proxied by gross capital formation (GCF), and labour by population (POP) due to limitations of labour data for the period under study. Additional variables of oil export (OILX), non-oil exports (NOILX), imports (IMP) and foreign reserve (FRS) in U.S dollars was added to the cointegration and causality models. Trade and development theory identify export as crucial components of economic growth. Reizman et al. (1996) pointed import as a crucial variable for testing the export-led growth hypothesis. Foreign reserve is affected positively by exports and negatively by imports.

3.1 Cointegration Test

On theoretical grounds, variables with integration order I (1) may be cointegrated in the long run. As such, the order of integration of macroeconomic variables should be established prior to cointegration test by conducting a unit root test on dependent and all independent variables. This paper adopts the Augmented Dickey Fuller (ADF) test to determine the order of integration, and employs the Johansen (1988), and Johansen and Juselius (1990) maximum likelihood cointegration technique to determine the number of cointegrating vectors. The Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC) is used to determine the optimal lag length.

The multivariate cointegration test has the following expression:

$$\Delta Q_t = \sum_{i=1}^{p-1} \Gamma_i \Delta Q_{t-i} + \Pi Q_{t-p} + \mu_t \qquad (1)$$

Where
Δ = Difference Operator
Q_t = (n x 1) vector of integrated I (1) variables
Γ = (n x n) matrix of coefficients
Π = (n x n) matrix of parameters
μ_t = (n x 1) vector of error terms

In equation (1), cointegrating vectors among Q elements suggest that Π has rank such that r $(0 < r < n)$. To find the cointegrating vectors, the likelihood ratio test of trace test (λ_{trace}) and maximum Eigen value test (λ_{max}) is used in the Johansen procedure.

3.2 Granger Causality

The presence of cointegration implies long run relationship among variables, but causality direction in the long run and short run needs to be determined using an appropriate error correction models as suggested by Engel and Granger (1987). This study will require using a total of seven system equations (2–8) within a vector error correction model (VECM) to analyse the long run and short run causal directions. The significance and sign (-) of the error correction term in each system equation is used to confirm unidirectional long run causal flow while the joint significance of the lagged values of the independent variables in each system equation is used to support short run unidirectional causality. The set of system equations used in the VECM to determine long run and short run causal flow is given below:

$$\Delta LRGDP_t = \beta_1 + \sum_{i=1}^{k} \Phi_{1i}\,\Delta LRGDP_{t-1} + \sum_{i=1}^{L} \Psi_{1i}\,\Delta LOILX_{t-1} + \sum_{i=1}^{m} \theta_{1i}\,\Delta LNOILX_{t-1} + \sum_{i=1}^{n} \partial_{1i}\,\Delta LIMP_{t-1} + \sum_{i=1}^{r} \varkappa_{1i}\,\Delta LGCF_{t-1} + \sum_{i=1}^{s} \pi_{1i}\,\Delta POP_{t-1} + \sum_{i=1}^{v} \lambda_{1i}\,\Delta LFRS_{t-1} + \sum_{i=1}^{z} \sigma_{1i} ECT_{z,t-1} + \epsilon_{1t} \quad (2)$$

$$\Delta LOILX_t = \beta_1 + \sum_{i=1}^{k} \Phi_{1i}\,\Delta LRGDP_{t-1} + \sum_{i=1}^{L} \Psi_{1i}\,\Delta LOILX_{t-1} + \sum_{i=1}^{m} \theta_{1i}\,\Delta LNOILX_{t-1} + \sum_{i=1}^{n} \partial_{1i}\,\Delta LIMP_{t-1} + \sum_{i=1}^{r} \varkappa_{1i}\,\Delta LGCF_{t-1} + \sum_{i=1}^{s} \pi_{1i}\,\Delta POP_{t-1} + \sum_{i=1}^{v} \lambda_{1i}\,\Delta LFRS_{t-1} + \sum_{i=1}^{z} \sigma_{1i} ECT_{z,t-1} + \epsilon_{1t} \quad (3)$$

$$\Delta LNOILX_t = \beta_1 + \sum_{i=1}^{k} \Phi_{1i}\,\Delta LRGDP_{t-1} + \sum_{i=1}^{L} \Psi_{1i}\,\Delta LOILX_{t-1} + \sum_{i=1}^{m} \theta_{1i}\,\Delta LNOILX_{t-1} + \sum_{i=1}^{n} \partial_{1i}\,\Delta LIMP_{t-1} + \sum_{i=1}^{r} \varkappa_{1i}\,\Delta LGCF_{t-1} + \sum_{i=1}^{s} \pi_{1i}\,\Delta POP_{t-1} + \sum_{i=1}^{v} \lambda_{1i}\,\Delta LFRS_{t-1} + \sum_{i=1}^{z} \sigma_{1i} ECT_{z,t-1} + \epsilon_{1t} \quad (4)$$

$$\Delta LIMP_t = \beta_1 + \sum_{i=1}^{k} \Phi_{1i}\,\Delta LRGDP_{t-1} + \sum_{i=1}^{L} \Psi_{1i}\,\Delta LOILX_{t-1} + \sum_{i=1}^{m} \theta_{1i}\,\Delta LNOILX_{t-1} + \sum_{i=1}^{n} \partial_{1i}\,\Delta LIMP_{t-1} + \sum_{i=1}^{r} \varkappa_{1i}\,\Delta LGCF_{t-1} + \sum_{i=1}^{s} \pi_{1i}\,\Delta POP_{t-1} + \sum_{i=1}^{v} \lambda_{1i}\,\Delta LFRS_{t-1} + \sum_{i=1}^{z} \sigma_{1i} ECT_{z,t-1} + \epsilon_{1t} \quad (5)$$

$$\Delta LGCF_t = \beta_1 + \sum_{i=1}^{k} \Phi_{1i}\,\Delta LRGDP_{t-1} + \sum_{i=1}^{L} \Psi_{1i}\,\Delta LOILX_{t-1} + \sum_{i=1}^{m} \theta_{1i}\,\Delta LNOILX_{t-1} + \sum_{i=1}^{n} \partial_{1i}\,\Delta LIMP_{t-1} + \sum_{i=1}^{r} \varkappa_{1i}\,\Delta LGCF_{t-1} + \sum_{i=1}^{s} \pi_{1i}\,\Delta POP_{t-1} + \sum_{i=1}^{v} \lambda_{1i}\,\Delta LFRS_{t-1} + \sum_{i=1}^{z} \sigma_{1i} ECT_{z,t-1} + \epsilon_{1t} \quad (6)$$

$$\Delta LPOP_t = \beta_1 + \sum_{i=1}^{k} \Phi_{1i}\,\Delta LRGDP_{t-1} + \sum_{i=1}^{L} \Psi_{1i}\,\Delta LOILX_{t-1} + \sum_{i=1}^{m} \theta_{1i}\,\Delta LNOILX_{t-1} + \sum_{i=1}^{n} \partial_{1i}\,\Delta LIMP_{t-1} + \sum_{i=1}^{r} \varkappa_{1i}\,\Delta LGCF_{t-1} + \sum_{i=1}^{s} \pi_{1i}\,\Delta POP_{t-1} + \sum_{i=1}^{v} \lambda_{1i}\,\Delta LFRS_{t-1} + \sum_{i=1}^{z} \sigma_{1i} ECT_{z,t-1} + \epsilon_{1t} \quad (7)$$

$$\Delta LFRS_t = \beta_1 + \sum_{i=1}^{k} \Phi_{1i}\,\Delta LRGDP_{t-1} + \sum_{i=1}^{L} \Psi_{1i}\,\Delta LOILX_{t-1} + \sum_{i=1}^{m} \theta_{1i}\,\Delta LNOILX_{t-1} + \sum_{i=1}^{n} \partial_{1i}\,\Delta LIMP_{t-1} + \sum_{i=1}^{r} \varkappa_{1i}\,\Delta LGCF_{t-1} + \sum_{i=1}^{s} \pi_{1i}\,\Delta POP_{t-1} + \sum_{i=1}^{v} \lambda_{1i}\,\Delta LFRS_{t-1} + \sum_{i=1}^{z} \sigma_{1i} ECT_{z,t-1} + \epsilon_{1t} \quad (8)$$

In the set of equations (2-8*), LRGDP, LOILX, LNOILX, LIMP, LGCF, LPOP & LFRS* represent logged model dependent and independent variables described in section 3. Delta (Δ) symbol is the first difference operator, and ECT is the error correction term for the model obtained from the Johansen cointegration test. The symbol ε_t is the zero-mean uncorrelated random error terms (for i = 1, 2, 3, 4, 5, 6, 7).

4. Empirical Results and Interpretation

4.1 Test of Stationarity

The order of integration for each variable was established using the Augmented Dickey Fuller (ADF) test on logged form of both dependent and independent variables. Table 1 gives a summary of the unit root test results.

Table 1. Augmented Dickey Fuller (ADF) Unit Root Test

Variables	Level	5% Critical Value	First Difference	5% Critical Value	Remark
LRGDP	1.59	-2.95	-4.34*	-2.95	I (1)
LOILX	-1.22	-2.95	-5.96*	-2.95	I (1)
LNOIL	-0.90	-2.95	-6.79*	-2.95	I (1)
LIMP	-2.15	-2.95	-6.83*	-2.95	I (1)
LGCF	-2.86	-2.95	-5.74*	-2.96	I (1)
LPOP	-0.81	-2.98	-3.74*	-2.99	I (1)
LFRS	-0.53	-2.96	-4.87*	-2.96	I (1)

Note * denotes null rejection at 5% significance level

The results from table 1 indicate that all variables are non-stationary at level and become stationary at first difference suggesting I (1) order of integration. This justifies using the Johansen cointegration test to account for the possible number of cointegrating vectors.

4.2 Cointegration test

The Johansen test of cointegration is applied to determine if the variables have a cointegrating or long run relationship. Table 2 shows a summary for the cointegration test.

Table 2. Johansen's Cointegration Test

Vector		Trace Statistics	Critical value	Prob.	Max-Eigen Statistics	Critical Value	Prob.
H_o	H_1	(λ_{trace})	5%		(λ_{max})	5%	
r = 0	r >0	192.2058*	125.62	0.0000	79.4970*	46.23	0.0000
r <= 1	r >1	112.7089*	95.75	0.0021	46.97691*	40.0775	0.0072
r <= 2	r >2	65.7319	69.82	0.1014	24.3298	33.88	0.4317
r <= 3	r >3	41.4021	47.86	0.1762	19.8862	27.58	0.3491

Note: r is number of cointegrating vector(s)
* denotes null rejection at 5% level

The trace and max-Eigen statistics in table 2 indicate two (2) cointegrating equations. The null (H_o) hypothesis of no cointegration is rejected at 5% level in favour of the alternative (H_1), and the null hypothesis of two cointegrating vectors cannot be rejected at 5% level for both trace and max-Eigen statistics. As such, we conclude that model variables of RGDP, OILX, NOILX, IMP, GCF, POP, and FRS are cointegrated or they have a long run relationship. The results also agree with the findings by Idowu (2005), Ewetan & Okodua (2013), and Ugochukwu and Chinyere (2013), but contradicted Deme (2002) which is most likely a consequence of difference in time periods.

4.3 Vector Error Correction Model

The direction of causality in the long run and short run is analysed using a vector error correction model (VECM) following the establishment of cointegration between model variables. Hence, the long run and short run causality analysis was achieved using a system of equations (*2-8*) discussed in section 3.2. Each set of equations is used to test one way causal flow from independent to dependent variables in the seven models, A to G in table 3.

Journal of Economics and Sustainable Development www.iiste.org
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.8, No.14, 2017

Table 3. Summary Results of VECM Long Run Causality Test

	Model A	Model B	Model C	Model D	Model E	Model F	Model G
	Δ(InRGDP)	Δ(InOILX)	Δ(InNOILX)	Δ(InIMP)	Δ(InGCF)	Δ(InPOP)	Δ(InFRS)
Constant	-2.0070 (1.4982)	-16.6217 (12.0410)	-33.4661 (6.1339)	-10.5079 (5.5954)	-1.9814 (4.9851)	0.0056 (0.0016)	-15.9049 (9.9266)
ECT (-1)	-0.2062 (0.1218)	-1.9128 (0.9793)**	-2.8035 (0.4989)*	-0.8077 (0.4551)**	0.3810 (0.4054)	0.0003 (0.0001)*	-1.6406 (0.8073)**
R^2	0.6312	0.4389	0.8720	0.7668	0.6817	0.9957	0.6579
S.E of Regression	0.05742	0.4615	0.2351	0.2145	0.1911	6.46E-05	0.3805
F- Stat.	1.6048 [0.1830]	0.7333 [0.7277]	6.3879 [0.0004]*	3.0832 [0.01744]*	2.0077 [0.0924]**	215.8418 [0.0000]*	1.8033 [0.1303]
Serial Correlation	12.3385 [0.0021]*	1.3021 [0.5215]	4.6969 [0.0955]**	6.5767 [0.0373]*	1.7479 [0.4173]	10.3029 [0.0058]	0.5335 [0.7659]
Normality	0.3574 [0.8364]	1.1847 [0.553028]	0.7788 [0.6775]	0.4382 [0.8032]	1.0562 [0.5898]	1.4504 [0.4842]	0.1816 [0.9131]
Heteroscedasticity	0.3574 [[0.2145]	19.1586 [0.4467]	27.2869 [0.0981]**	20.6810 [0.3542]	21.6644 [0.3013]	24.0745 [0.1933]	21.6602 [0.3015]
ARCH	0.5547 [0.4564]	1.0032 [0.3165]	0.6259 [0.4288]	1.05760 [0.3038]	0.0832 [0.7729]	0.0004 [0.9839]	1.2772 [0.2592]

Note: Standard Errors reported in ( ) brackets
Probability reported in [ ] brackets
* and ** denotes null rejection at 5% & 10% level

In each model from table 3 the existence of a unidirectional causality from independent to dependent variables is confirmed by the sign (-) of the value of the error-correction term (ECT) and its statistical significance at the chosen significance level (10%). The joint significance of all variables in each model is given by the significance of the F-statistic. Model goodness of fit is reported by the coefficient of determination (R^2) and diagnostic test is indicated by the test of serial correlation, normality, heteroscedasticity test and ARCH.

In model A, the ECT is negative, but is insignificant at 10% level. As such, there is no one way causal flow from the independent to dependent variable of *RGDP*. The R^2 suggest that 63% of variation of the dependent variable is explained by the model independent variables. The null hypothesis of joint significance (F-test) cannot be rejected at both 5% and 10% level. However, the model diagnostic test shows it has serial correlation, but residuals are normally distributed, no ARCH effect and no heteroscedasticity.

In model B, the ECT has the expected negative sign and is statistically significant at 10% level. Hence, it suggests unidirectional causal flow from the independent variables to oil exports (*OILX*). The ECT also suggests that the speed of adjustment for oil exports towards equilibrium is very rapid at about 191.3 percent from the past year's deviation so as to attain stability. The F-test for joint significance is not rejected at 10% level. The model residuals are normally distributed, the model has no serial correlation, no heteroscedasticity and no ARCH effect. The same analogy was applied to model C through G and the following main causal inferences were established:

- Unidirectional causality flow from GDP to oil and non-oil exports in model B supports the growth-led export hypothesis.
- Bidirectional causality between oil, non-oil exports, imports, population and foreign reserve is implied by model B, C, D, F & G.
- Unidirectional causality from all model B independent variables to oil exports.
- Unidirectional causality in model C from all independent variables to non-oil exports.
- Unidirectional causality in model D from all independent variables to imports.
- Unidirectional causality in model F from all independent variables to population.
- Unidirectional causality flow to foreign reserve in model G from all independent variables.

Table 4. Summary Results of VECM Short Run Causality Test

	Model A	**Model B**	**Model C**	**Model D**	**Model E**	**Model F**	**Model G**
	Δ(InRGDP)	Δ(InOILX)	Δ(InNOILX)	Δ(InIMP)	Δ(InGCF)	Δ(InPOP)	Δ(InFRS)
Δ(InRGDP)	--	[0.7087]	[0.4697]	[0.5674]	[0.4037]	[0.2377]	[0.12247]
Δ(InOILX)	[0.0215]*	--	[0.0000]*	[0.2834]	[0.2779]	[0.2419]	[0.2091]
Δ(InNOILX)	[0.0349]*	[0.0790]**	--	[0.0089]*	[0.2523]	[0.0115]*	[0.0925]**
Δ(InIMP)	[0.5102]	[0.2849]	[0.6197]	--	[0.4251]	[0.1014]	[0.5628]
Δ(InGCF)	[0.9160]	[0.6317]	[0.0528]**	[0.0404]*	--	[0.4020]	[0.4728]
Δ(InPOP)	[0.2428]	[0.3783]	[0.0000]*	[0.0560]**	[0.3802]	--	[0.2836]
Δ(InFRS)	[0.2400]	[0.6255]	[0.0003]*	[0.0210]*	[0.3991]	[0.5052]	--

Note: Probability reported in [ ] brackets
* and ** denotes null rejection at 5% & 10% level

The Wald test for joint significance for the lagged endogenous variables in each model from A – G in table 4 was used to analyse short run causal flow. A rejection of the null hypothesis signifies a unidirectional flow from the explanatory to the dependent variable in each model. In model A, both oil and non-oil exports granger cause real GDP. In model B, non-oil export granger cause oil export as the null hypothesis of non-granger causality is rejected at 10% level. The rest of the models were analysed and the following inferences was made:

- The export-led growth hypothesis is supported in model A by the unidirectional granger causality flow from oil and non-oil exports to GDP
- Bidirectional causality between oil exports and non-oil exports from model B and C
- Bidirectional causality between population and non-oil exports from model C and F
- Unidirectional causality from gross capital formation to non-oil export from model B
- Bidirectional causality from model C and G between non-oil export and foreign reserve

The findings for the short run causality are in agreement with the results of Deme (2002) who supported the export-led growth hypothesis in the short run, but contradicted the findings by Ewetan & Okodua (2013), Ugochukwu and Chinyere (2013) who supported the growth-led exports hypothesis in the short run. This paper and Deme (2012) used the same method against the pair-wise granger causality adopted by the other two studies. The results also indicate that there is a dynamic relationship between oil exports, non-oil exports and foreign reserve.

5. Summary and Conclusion

The paper examined the causal relationship between exports components of oil, non-oil sector, imports, gross capital formation, population, foreign reserve and Nigerian economic growth using annual time series data for the period 1981 to 2015. The Johansen cointegration technique was employed to analyse the long run relationship and Granger causality within a vector error correction model to establish the causal directions.

The findings suggest that the recent macroeconomic policies particularly those aimed at promoting exports in the non-oil sector will be effective in influencing economic growth through the short run causal linkages, and improvements in economic growth is transmitted back to promote efficiency in the exports of oil and non-oil sector through the long run causal linkages as equilibrium is achieved. The results also highlight the crucial impact import and foreign reserve exacts on both the exports sector and Nigerian economic growth. The export sectors of the economy rely heavily on imports for capital like machineries and foreign expertise. Hence, restriction on imports through the use of quotas, and tax related instruments like custom duties should be increased marginally over a period of time until efficiency in the exports segment of the Nigerian economy is vastly improved through the use of modern technology and innovations.

Lastly, improvement in non-oil export sectors such as agriculture and manufacturing can be achieved through active participation by a larger proportion of the Nigerian population. Economic gains are transmitted back to the population to improve standard of living through the short and long run linkages.

References

Ahmad, J., & Kwan, A. C. C. (1991). Causality between exports and economic growth: Empirical evidence from Africa. *Economics Letters, 37*(2), 243-248.

Ahmad, J., & Harnhirun, S. (1996). Cointegration and causality between exports and economic growth: Evidence from the ASEAN countries. *The Canadian Journal of Economics / Revue Canadienne d'Economique, 29*, S413-S416. doi: 10.2307/136078

Awokuse, T. O. (2003). Is the export-led growth hypothesis valid for Canada? *The Canadian Journal of*

Economics / Revue Canadienne d'Economique, 36(1), 126-136.
Bahmani-Oskooee, M., Mohtadi, H., & and Shabsigh, G. (1991). Exports, growth and causality in LDCs: A re-examination. *Journal of Development Economics, 36*(2), 405-415.
Bahmani-Oskooee, M., & Alse, J. (1993). Export growth and economic growth: An application of cointegration and error-correction modelling. *The Journal of Developing Areas, 27*(4), 535-542.
Bahmani-Oskooee, M., & Economidou, C. (2009). Export led growth vs. growth led exports: LDCs experience. *The Journal of Developing Areas, 42*(2), 179-212.
Balassa, B. (1978). Exports and economic growth: Further evidence. *Journal of Development Economics, 5*(2), 181-189.
Bhagwati, J. (1978). *Anatomy and consequences of exchange control regimes: Liberalization attempts and consequences*. Cambridge: Ballinger.
Chow, P. C. Y. (1987). Causality between export growth and industrial development: empirical evidence from the NICs. *Journal of Development Economics, 26*(1), 55-63.
Deme, M. (2002). An examination of the trade-led growth hypothesis in Nigeria: A co-integration, causality, and impulse response analysis. *The Journal of Developing Areas, 36*(1), 1-15.
Doraisami, A. (1996). Export growth and economic growth: A re-examination of some time-series evidence of the Malaysian experience. *The Journal of Developing Areas, 30*(2), 223-230.
Engle, R.F. and Granger, C.W.J. (1987) Cointegration and Error Correction: Representation, Estimation and Testing. *Econometrica*, 55, 251-276. doi.org/10.2307/1913236
Ewetan, O. O., & Okodua, H. (2013). Econometric analysis of exports and economic growth in Nigeria. *Journal of Business Management and Applied Economics, 2*(3)
Fosu, A. K. (1990). Exports and economic growth: The African case. *World Development, 18*, 831-835.
Fosu, A. K. (1996). Primary exports and economic growth in developing countries. *World Economy, 19*, 465-475.
Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica, 37*(3), 424-438.
Greenaway, D., & Sapsford, D. (1994). Exports, growth, and liberalization: An evaluation. *Journal of Policy Modelling, 16*, 165-186.
Heller, P. S., & Porter, R. C. (1978). Exports and growth: An empirical re- investigation. *Journal of Development Economics, 5*(2), 191-193.
Henriques, I., & Sadorsky, P. (1996). Export-led growth or growth-driven exports? The Canadian case. *The Canadian Journal of Economics / Revue Canadienne d'Economique, 29*(3), 540-555. doi: 10.2307/136249
Holman, J. A., & Graves, P. E. (1995). Korean exports and economic growth: An econometric reassessment. *Journal of Economic Development, 20*(2), 45-56.
Idowu, K. O. (2005). A preliminary investigation into the causal relationship between exports and economic growth in Nigeria. *CBN Economic and Financial Review, 43*(3), 29-50.
Islam, M. N. (1998). Export expansion and economic growth: Testing for cointegration and causality. *Applied Economics, 30*(3), 415-425.
Jin, J. C., & Eden, S. Y. (1995). The causal relationship between exports and income. *Journal of Economic Development, 20*(1), 131-140.
Johansen, S. (1988). Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control*, *12*(2–3), 231–254.
Johansen, S., & Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration– with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, *52*(2), 169–210.
Jung, S. W., & Marshall, P. J. (1985). Exports, growth and causality in developing countries. *Journal of Development Economics, 18*(1), 1-12.
Kaushik, K. K., & Klein, K. K. (2008). Export growth, export instability, investment and economic growth in India: A time series analysis. *The Journal of Developing Areas, 41*(2), 155-170.
Kavoussi, R. M. (1984). Export expansion and economic growth: Further empirical evidence. *Journal of Development Economics, 14*, 241-250.
Kravis, I. (1970). Trade as a handmaiden of growth: Similarities between the nineteenth and twentieth centuries. *Economic Journal, 80*(320), 850-872.
Krueger, A. O. (1978). *Foreign trade regimes and economic development: Liberalization attempts and consequences*. Cambridge: MA: Ballinger.
Kugler, P., & Dridi, J. (1993). Growth and exports in LDCs: A multivariate time series study. *International Review of Economics and Business, 40*(9), 759-767.
Love, J. (1994). Engines of growth: The export and government sectors. *World Economy, 17*, 203-218.
Mahadevan, R. (2009). The sustainability of export-led growth: The Singaporean experience. *The Journal of Developing Areas, 43*(1), 233-247.
Marin, D. (1992). Is the export-led growth hypothesis valid for industrialized countries? *The Review of*

Economics and Statistics, 74(4), 678-688. doi: 10.2307/2109382

Moschos, D. (1989). Export expansion, growth and the level of economic development: An empirical analysis. *Journal of Development Economics, 30*(1), 93-102.

Odusola, A. F., & Akinlo, A. E. (1995). *Trade, growth and causality in Nigeria, in external trade and economic development in Nigeria* (selected papers for the Annual Conference of the Nigerian Economic Society (NES). ed.).

Onafowora, O. A., Owoye, O., & Nyatepe-Coo, A. A. (1996). Trade policy, export performance and economic growth: Evidence from sub-Saharan Africa. *Journal of International Trade and Economic Development, 5*, 341-360.

Oxley, L. (1993). Co-integration, causality and export-led growth in Portugal, 1865- 1985. *Economic Letters, 43*(2), 163-166.

Ozturk, I., & Acaravci, A. (2010). Testing the export-led growth hypothesis: Empirical evidence from turkey. *The Journal of Developing Areas, 44*(1), 245-254.

Plümper, T., & Graff, M. (2001). Export specialization and economic growth. *Review of International Political Economy, 8*(4), 661-688.

Ram, R. (1985). Exports and economic growth: Some additional evidence. *Economic Development and Cultural Change, 33*(2), 415-425.

Ram, R. (1987). Exports and economic growth in developing countries: Evidence from time-series and cross-section data. *Economic Development and Cultural Change, 36*(1), 51-72.

Reizman, R., Whiteman, C., & Summers, P. (1996). The engine of growth or its handmaiden? A time series assessment of export-led growth. *Empirical Economics, 21*(1), 77-110.

Ronald, V. A. S., & Weaver, J. H. (1993). Exports and economic growth in a simultaneous equations model. *The Journal of Developing Areas, 27*(3), 289-306.

Salvatore, D., & and Hatcher, T. (1991). Inward and outward oriented trade strategies. *Journal of Development Studies, 27*, 7-25.

Serletis, A. (1992). Export growth and Canadian economic development. *Journal of Development Economics, 38*(1), 133-145.

Sims, C. A. (1972). Money, income and causality. *American Economic Review, 62*(4), 540-552.

Singer, H. W., & Gray, H. (1988). Trade policy and growth of developing countries: Some new data. *World Development, 16*(3), 395-403.

Sulaiman, M., & Saad, N. M. (2009). An analysis of export performance and economic growth of Malaysia using co-integration and error correction models. *The Journal of Developing Areas, 43*(1), 217-231.

Tyler, W. (1981). Growth and export expansion in developing countries: Some empirical evidence. *Journal of Development Economics, 9*(1), 121-130.

Uche, M. O. (2009). Exports and economic growth in Nigeria: An empirical analysis. *A Paper Submitted to the Nigerian Economic Society (NES).*

Ugochukwu, U. S., & Chinyere, U. P. (2013). The impact of export trading and economic growth in Nigeria. *International Journal of Economics, Business and Finance, 1*(10), 327-341.

Ukpolo, V. (1994). Export composition and growth of selected low-income African countries: Evidence from time-series data. *Applied Economics, 26*, 445-449.

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

Voivodas, C. S. (1973). Foreign capital inflow and economic growth. *Journal of International Economics, 3*(4), 337-349.

Williamson, R. B. (1978). The role of exports and foreign capital in Latin American economic growth. *Southern Economic Journal, 45*, 410-420.

Xu, Z. (1996). On the causality between export growth and GDP growth: An empirical reinvestigation. *Review of International Economics, 4*, 172-184.

Zestos, G. K., & Tao, X. (2002). Trade and GDP growth: Causal relations in the united states and Canada. *Southern Economic Journal, 68*(4), 859-874. doi:10.2307/1061496