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THE IMPACT OF AGRICULTURAL EXPORTS ON ECONOMIC GROWTH IN NIGERIA

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Abstract

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Agriculture is the backbone of Nigeria's socioeconomic development. This paper investigates the impact of agricultural exports on economic growth in Nigeria using OLS regression, Granger causality, Impulse Response Function and Variance Decomposition approaches. Both the OLS regression and Granger causality results support the hypothesis that agricultural exports- led economic growth in Nigeria. The results, however, show an inverse relationship between the agricultural degree of openness and economic growth in the country. Impulse Response Function results fluctuate and reveal an upward and downward shocks from agricultural export to economic growth in the country. The Variance Decomposition results also show that a shock to agricultural exports can contribute to the fluctuation in the variance of economic growth in the long run. For Nigeria to experience a favourable trade balance in agricultural trade, domestic processing industries should be encouraged while imports of agricultural commodities that the country could process cheaply should be discouraged. Undoubtedly, this measure could drastically reduce the country's overreliance on food imports and increase the rate of agricultural production for self-sufficiency, exports and its contribution to the economic growth in the country.

Keywords: economic growth, degree of openness, Granger causality, REER

INTRODUCTION

There is a long-standing debate over the relationship between the export and economic growth in both advanced and less advanced economies. There are a couple of empirical studies that confirm the robust connection between export and economic growth in countries across the globe. Some studies support the hypothesis of export-led growth (ELG) mostly in the developing nations (Chenery and Strout, 1966; Michaely, 1977; Balassa, 1978; Tyler, 1981; Kavoussi, 1984; Ram, 1985; Shirazi and Manap, 2005; Kang, 2015). They argue that the exports of goods and services generate foreign exchange that is required to import foreign goods. The increase in underlying commodities' imports, in turn, stimulate a nation's capacity to produce in the long run. This is more pronounced in less developed economies that have a heavy disadvantage in the production of capital goods.

Empirical evidence of ELG has also been confirmed in the developed countries, such as Germany, Switzerland, Canada, United Kingdom and Japan (Kugler, 1991; Henriques and Sadorsky, 1996; Boltho, 1996). Scholars have opined that export is a vital tool for stimulating sustainable economic growth and development in countries that are poised to develop. For instance, Kónya (2004) investigates export-led growth hypothesis in twenty-five OECD countries. Using Granger causality approach, the results reveal that exports Granger cause- economic growth in many OECD countries such as Iceland, Sweden, Canada, Japan and Korea. Notwithstanding, the results further show that Export does not Granger cause- growth in Luxembourg and the Netherlands.

Until recently, scholars had paid attention to general phenomena that ELG, research on the relationship between subsectors such as agricultural exports and economic growth was not given serious attention. Given that ELG hypothesis has been confirmed in countries, it is worthwhile to determine if agricultural export also led- economic growth. Economists, world organizations and scientist believe that agricultural export is a catalyst for growth, especially in developing countries where it is the main source of foreign earnings and national incomes (Verter and Bečvářová, 2014; Verter, 2015). They also have some arguments in support of trade in food and agriculture. International trade brings the total amount of goods and services to the countries involved. It also brings the diversity of commodities that increase choices to the populace. To some extent, trade maintains stable demand and supply that allows efficient exchanges and stimulate economic growth and development in countries (Erokhin, Ivolga and Heijman, 2014; Verter and Bečvářová, 2014). Nevertheless, agricultural exports can accelerate a balanced growth in all countries involved if only issues (trade restrictions and distortions) related to the world trade in primary agricultural trade are addressed or drastically reduced (Anderson and Martin, 2005; McCally and Nash, 2007; Laborde and Martin, 2012; Verter, 2015).

Empirically, Sanjuán-López and Dawson (2010) determine the connection between GDP and agricultural and non-agricultural exports in 42 countries using panel cointegration methods. Their findings indicate that a long-run relationship exists between the variables in the model. The results further show that agricultural exports Granger-cause economic growth. Thus, confirm the export-led growth hypothesis for the 42 countries under study. Similarly, Henneberry and Curry (2010) examine the relationship between agricultural exports and economic growth in Pakistan. Using three simultaneous equations representing GDP, agricultural exports, and imports, they find a favourable relationship between agricultural exports and economic growth in the country.

Kang (2015) investigates the evidence of the export-led growth in major rice exporting countries using some econometric approaches. The results confirm that agricultural export- led growth in the major rice exporting countries such as Pakistan, Vietnam and Thailand. In the same direction, Dawson (2005) examines the contribution of agricultural exports to economic growth in less developed countries. The results show significant structural differences in economic growth between low, lower-middle, and upper-income countries. The findings further indicate that investment in the agricultural export has an effect on economic growth in those countries. Arguably, proactive measures or policies should be promoted for agricultural exports and growth in countries across the globe.

In the same line, using panel data analysis, Bbaale and Mutenyo (2011) confirm that agricultural exports-led income per capita in Sub-Saharan African Countries. In the same fashion, Shombe (2008) also confirms that agricultural export-led economic performance in Tanzania. Onogwu (2014) finds out that intra-industry trade in cereal crop has positively impacted the gross national income per capita in the Economic Community of West African States (ECOWAS). Arguably, both exports and imports growth rates of these commodities fluctuate over time. Similarly, some studies (Bbaale and Mutenyo, 2011; Gbaiye *et al.*, 2013; Ijirshar, 2015; Ojo, Awe and Ogunjobi, 2014; Onogwu, 2014; Ojide, Ojide and Ogbodo, 2014) have also confirmed the hypothesis that agricultural export-led economic growth in Nigeria.

In contrast to agricultural export- led growth arguments above, proponents of the opposite viewpoint opine that the agricultural export does not have a robust connection for fostering economic growth. Studies by Marshall, Schwart and Ziliak (1988), Faridi (2012) do not support the hypothesis that agricultural exports-led growth in the developing countries.

As shown in Tab. I, prior to the extraction of petroleum products in Nigeria, especially before the oil boom in the early 1970s, the state was solely dependent on agriculture as major export products and foreign earnings. Even though agricultural production and exports have been severely neglected for oil in recent decades (Verter and Bečvářová, 2014), it is still the major non-oil foreign exchange earner in Nigeria and other Sub-Saharan African countries (SSA). Thus, the importance of agriculture to the economy of Nigeria and other SSA countries cannot be overemphasized (Tab. II). Owing to the recent dramatic increase in oil production in the USA, formerly, Nigeria's highest oil export destination, and the recent discovery and production of petroleum in other countries like Ghana and Tanzania, coupled with persistent dwindling price of oil in the world market, the demand for the Nigeria's oil has been threatened. In other words, Nigeria's economy is vulnerable to the global oil price shocks (Osakwe, Verter and Darkwah, 2015). As a consequence, the country's economy is presently in turmoil and distress. For Nigeria to survive as a nation now or the near future, economic diversification is inevitable.

Consequently, economists have called for export diversification by promoting and stimulating other sectors (i.e. agricultural commodities) of the economy for maximum domestic production and exports (Verter and Bečvářová, 2014). Does global trade in agriculture support the hypothesis that export- led economic growth in Nigeria? Empirical results so far have remained mixed, inconclusive or rather contradictory. Thus, the relevant of this present study. The primary objective of this article is to determine if agricultural export- led economic growth in Nigeria.

MATERIALS AND METHODS

For us to determine the effect of agricultural exports on economic growth in Nigeria, annual time series data spanning the period between 1980 and 2012 for the analysis were obtained from reputable institutions. Specifically, statistical data for the study have been obtained from the following

I: *Agricultural import and export and as percentage of trade in Nigeria*

Year	Value of agricultural trade			Percentage of total merchandise trade			Agriculture (% of real GDP)
	Export (1000 US$)	Import (1000 US$)	Trade balance (1000 US$)	Food export (%)	Food import (%)	Fuel export (%)	
1962	356,299	86,060	270,239	64.52	14.10	10.30	61.82
1965	460,754	88,219	372,535	54.38	9.10	25.88	55.36
1970	437,724	125,042	312,682	31.35	8.20	58.15	44.74
1974	445,745	579,239	–133,494	5.07	9.40	93.03	28.11
1975	536,432	329,307	207,125	5.17	9.50	93.30	22.98
1980	445,515	2,099,238	–1,653,723	3.18	21.60	95.10	20.61
1985	309,516	1,245,164	–935,648	2.18	17.96	97.00	38.25
1990	228,226	561,041	–332,815	1.46	6.36	-	39.94
1995	408,361	1,130,896	–722,535	1.62	17.51	-	40.75
2000	339,389	1,130,802	–791,413	0.14	19.92	99.97	42.65
2005	654,226	2,625,509	–1,971,283	0.36	17.96	-	41.19
2010	1,144,006	5,638,214	–4,494,208	3.34	10.25	87.13	40.87
2011	1,400,257	6,897,821	–5,497,564	1.80	30.56	89.13	40.19
2012	1,578,503	7,034,900	–5,456,397	5.34	22.71	84.04	39.21
2013	8,324,421	1,219,703	–7,104,718	5.05	17.83	87.62	38.44

Source: Authors' computation based on FAOSTAT, CBN and World Bank

II: *Agricultural, value added (% of GDP), and trade (% of merchandise trade) in Nigeria and some selected economies*[1]

Year	Agriculture, value added (% of GDP)					Food exports (% of merchandise exports)					Food imports (% of merchandise imports)			
	CIV	GHA	NGA	SSA	WLD	CIV	GHA	NGA	SSA	WLD	CIV	GHA	NGA	SSA
1970	31.9	53.9	-	19.7	-	67.7	77.8	31.4	-	16.2	15.9	20.9	8.2	-
1980	25.9	60.1	-	18.2	-	-	78.4	-	-	13.2	-	10.1	-	-
1981	26.5	55.3	28.5	20.8	-	64.7	51.3	2.2	16.5	13.3	20.3	8.8	15.5	9.5
2000	25.0	39.4	26.0	17.3	4.0	50.3	48.4	0.1	13.8	6.9	17.2	12.8	19.9	12.2
2005	22.6	40.9	32.8	17.3	3.3	38.3	51.7	-	-	6.8	14.6	13.9	-	10.1
2010	24.5	30.8	23.9	15.5	3.0	49.5	60.7	3.3	14.1	8.1	19.2	15.3	10.3	11.6
2011	26.7	26.0	22.3	15.1	3.1	50.7	27.5	1.8	12.1	8.3	25.1	15.4	30.6	14.6
2012	22.5	23.6	22.1	15.2	3.1	46.8	30.3	5.3	12.9	8.5	20.0	13.8	22.7	13.0
2013	22.1	23.2	21.0	14.7	3.1	38.5	32.1	5.1	13.8	8.7	14.6	16.8	17.8	11.5

Source: World Bank, 2015
Note: CIV = Cote d'Ivoire, GHA = Ghana, NGA = Nigeria, SSA = Sub-Saharan Africa, WLD = World, - = not available.

sources: United Nations Conference on Trade and Development (UNCTAD); Food and Agriculture Organization of the United Nations (FAO); Central Bank of Nigeria (CBN) Statistical bulletins; and the World Bank World Development Indicators.

To determine the if agricultural exports- led economic growth hypothesis in Nigeria, real GDP growth is captured as a function of the agricultural exports, the agricultural degree of openness, and real effective exchange rate. All the data in the models are run using Gretl and EViews 8 econometric software. The econometric model is specified as follows:

$$RGDPG = F\,(AX, ADO, REER). \qquad (1)$$

Thus, the model include an error term as follow:

$$RGDPG = \beta_0 + \beta_1 AX + \beta_2 ADO + \beta_3 REER + \varepsilon, \qquad (2)$$

1 Agriculture, value added (% of GDP): Agriculture corresponds to International Standard Industrial Classification (ISIC), 'divisions 1-5 and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources' (World Bank, 2015).

where RGDPG denotes the Real Gross Domestic Product Growth (%), proxied for economic growth. In this article, economic growth is mainly used in place of real GDP growth rate. AX stands for the agricultural export quantity index (2004–2006 = 100). FAO defines agricultural export quantity index as an aggregate agricultural and aggregate food product which represent the changes in the price-weighted sum of quantities of commodities traded between countries. ADO is the agricultural degree of openness [(agricultural export + agricultural import)/ nominal GDP]. It can also be called agricultural trade-to-GDP ratio or agricultural trade openness ratio, measured for the integration of agricultural trade into the global economy. REER is the Real Effective Exchange Rate Index (2010 = 100). REER is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs. An increase in REER implies that exports become more expensive than imports. Therefore, an increase indicates a loss of trade competitiveness (World Bank, 2015). Finally, ε represents the error term. All the explanatory variables in the model are expected to have positive impacts on economic growth in Nigeria.

In order to avoid reporting spurious regression outcomes, some models were proposed by Augmented Dickey-Fuller (1979) and Phillips-Perron (1998) for testing of a unit root in a time series data. The test determines whether the series is stationary at the level, first or second difference. Also, Unlike ADF, the PP test does not require that the ARIMA process is specified and would, hence, be less prone to the model misspecification than the ADF stationarity test. Also, the PP stationarity test corrects for serial correlation in a non-parametric fashion (AP). The standard Augmented Dickey-Fuller (ADF) test is carried out by estimating after subtracting from both sides of the equation:

$$\Delta y_t = \alpha y_{t-1} + x_t\delta + \varepsilon_t. \tag{3}$$

The null and alternative hypotheses are written as:

$$H_0\colon a = 0,\ H_1\colon a < 0. \tag{4}$$

Similarly, Phillips–Perron test involves fitting the regression as follow:

$$y_i = \alpha + \rho y_{i-1} + \epsilon_i. \tag{5}$$

The Vector Auto- Regression (VAR) is typically used for forecasting systems of interrelated multivariate time series data and for analysing the dynamic impact of random disturbances to the system of variables. The mathematical representation of a VAR model:

$$y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + \beta x_t + \varepsilon_t, \tag{6}$$

where y_t is a k of vector of endogenous variables, x_t is a d vector of exogenous variables, while $A_1, \ldots, A_p$ and B are matrices of coefficients to be estimated in the model, and ε_t is a vector of unobservable or white noise.

The most common approach for testing if there exists a causal relationship between two variables is Granger causality. The model was proposed by Granger (1969) to answer the question of whether x causes y and see how much of the current y could be explained by previous values of y and then to see whether adding lagged values of x could improve the explanation. The mathematical representation of Granger causality is:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots + \alpha_l y_{t-l} + \beta_1 x_{t-1} + \ldots + \beta_1 x_{-l} + \varepsilon_t, \tag{7}$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \ldots + \alpha_l x_{t-l} + \beta_1 y_{t-1} + \ldots + \beta_1 y_{-l} + \mu_t, \tag{8}$$

for all possible pairs of (x, y) time series in the group in the Granger equation. The Wald statistics for the joint hypothesis is:

$$\beta_1 = \beta_2 = \ldots = \beta_l = 0 \tag{9}$$

for each equation. The null hypothesis is that x does *not* Granger-cause y in the first regression and that y does *not* Granger-cause in the second regression.

RESULTS AND DISCUSSION

Owing to the fact that time series data is prone to spurious regression results (Granger and Newbold 1974), both ADF and PP unit root tests are run. The findings of the stationarity test are presented in Appendix A. The test results show that only RGDPG is stationary at level. The rest of the variables have become stationary after first difference. Given that all the variables in the model have become stationary, we proceed to run other regression methods. The Ordinary Least Squares (OLS) regression, Granger causality, Impulse Response Function (IRF) and Variance Decomposition Analysis (VDA) tests were run after unit root tests were carried out. Also, a diagnostic checklist for the OLS regression was conducted, and all the classical assumptions were fulfilled (Appendix B). Prior to Granger causality, IRF and VDA tests, unrestricted VAR model was applied. Based on the information criteria, the optimal lag length of four was chosen (Appendix C) to run the models in a VAR environment. The VAR residual tests such as normality test and autocorrelation test were also run, and all the checklists were fulfilled.

As presented in Tab. III, the OLS estimation result suggests a positive relationship between agricultural exports (AX) and economic growth (RGDPG) in Nigeria, statistically significant at the 5% level. It implies that ceteris paribus, a 1% percent increase in agricultural export may lead economic growth by 10%. This result is in line with the works of Shombe (2008); Bbaale and Mutenyo (2011); Ojo, Awe and Ogunjobi (2014); Ojide, Ojide

III: *OLS regression, some external determinants of economic growth in Nigeria*

	Dependent Variable: RGDP (economic growth)			
	Coefficient	**Std. Error**	**t-ratio**	**p-value**
constant	4.1280	1.1734	3.5179	0.0016
D(AX)	0.1046	0.0493	2.1236	0.0430**
D(ADO)	–0.5430	0.1790	–3.0340	0.0053***
D(REER-1)	0.0262	0.0122	2.1570	0.0401**
R-squared	0.3550		Adjusted R^2	0.2833
F(3, 27)	3.4890		P-value(F)	0.0293

Note: The asterisks (**, ***) denote statistical significance at 0.05, and 0.01 levels respectively.

IV: *VAR Granger Causality/ Block Exogeneity Wald Test (4 lags)*

Equation	Excluded	χ^2- statistic	df	Prob > χ^2
RGDPG	AX	9.44108	4	0.0510*
	ADO	2.26972	4	0.6863
	REER	24.1282	4	0.0001***
	All	62.2137	12	0.0000***
AX	RGDPG	8.60847	4	0.0717*
	ADO	4.61535	4	0.3291
	REER	4.23225	4	0.3755
	All	13.3412	12	0.3447
ADO	RGDPG	2.26449	4	0.6872
	AX	2.22755	4	0.6940
	REER	12.2701	4	0.0155**
	All	14.4786	12	0.2712
REER	RGDPG	9.40868	4	0.0517*
	AX	10.2885	4	0.0358**
	ADO	2.71768	4	0.6061
	All	18.8357	12	0.0926*

Note: ***, ** and * indicate the rejection of the null hypothesis at 0.01, 0.05 and 0.10 significance level respectively.

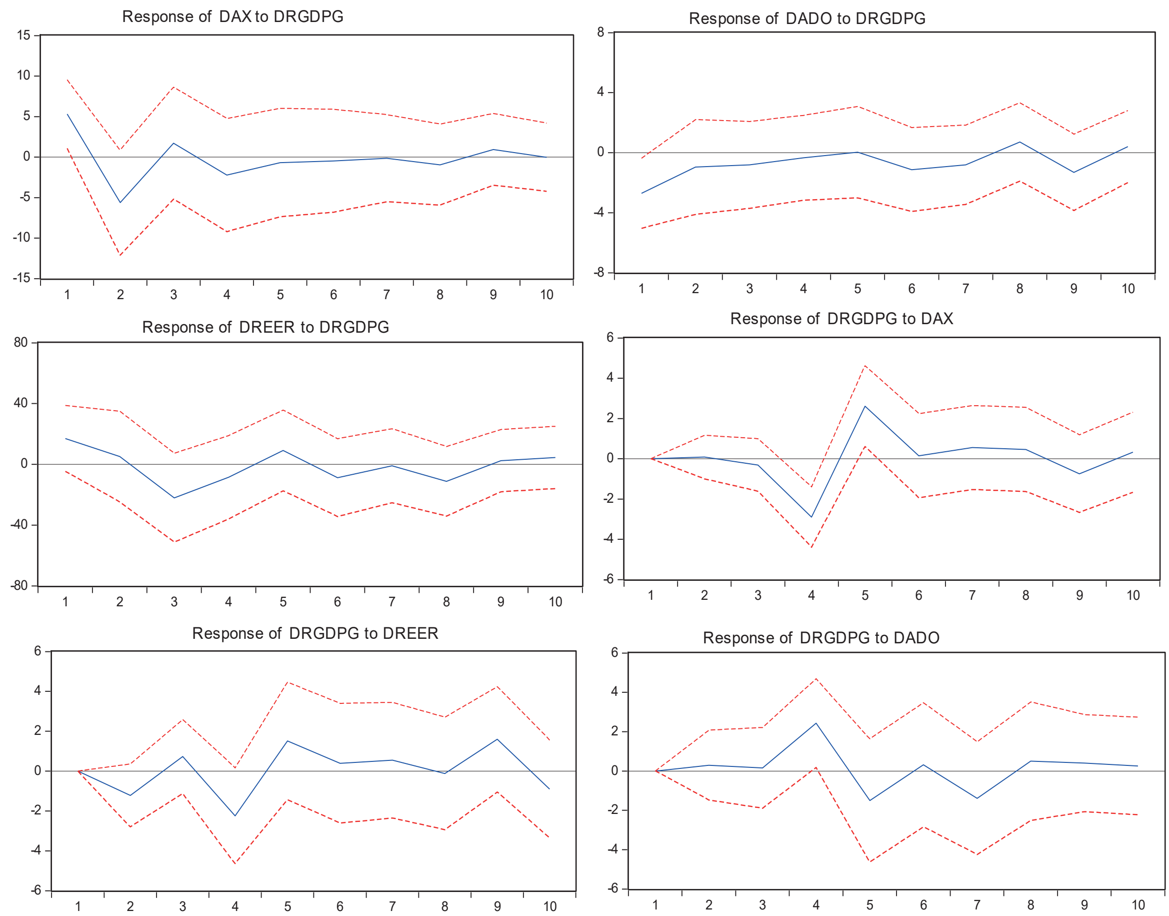
Ogbodo (2014); Shirazi and Manap (2005) who also confirm a positive relationship between exports and economic growth in Nigeria and other countries.

In the same fashion, the result further indicates that lagged real effective exchange rate (REER) has a positive effect on economic growth in Nigeria, statistically significant at the 5% level. This signifies that ceteris paribus, a 1% percent increase in REER may well stimulate economic growth by 2% in the country (Tab. III). This result contradicts with the works by Ojide, Ojide and Ogbodo (2014) who find an inverse relationship between exchange rate and economic growth in Nigeria.

Contrary to our prior expectation, the results show an inverse relationship between the agricultural degree of openness and economic growth in Nigeria, statistically significant at the 5% level (Tab. III). This result is in line with the works of Anowor, Ukweni and Martins (2013) who also find a negative relationship between agricultural trade openness and economic growth in Nigeria. Arguably, the result is not surprising as the country has been recording negative trade balance in agricultural products since 1975 (Tab. I). As a consequence, the massive import of agricultural commodities appears to have been negatively influencing economic growth in the country.

Granger (1969) causality test is employed using a lag length of four in a VAR environment (Appendix C). The results from the Granger causality technique is presented in Tab. IV. The result suggests there is a bidirectional causality running from agricultural export to economic growth in Nigeria. This result corresponds to the works by Sanjuán-López and Dawson (2010), Kang (2015), Ijirshar (2015) who also confirm that agricultural exports granger- cause economic growth in some producing countries. A feedback causality is also confirmed to be running from REER to economic growth in the country. Similarly, the result further signifies that agricultural exports, the agricultural degree of openness and REER jointly Granger-cause economic growth in Nigeria (Tab. IV).

A unidirectional causality is confirmed between REER and agricultural degree of openness. This result corresponds to the works of Tarawalie (2010), Verter and Osakwe (2015) who also confirm that REER Granger- cause economic growth in



1: *Response to Cholesky one SD (± 2 S.E. innovations)*

Sierra Leon and the Czech Republic. In the same direction, the results also establish a unidirectional relationship from agricultural exports to REER. The results further suggest that economic growth, exports and degree of openness jointly Granger-cause REER in Nigeria (Tab. IV).

Because, Granger-causality may not reveal the complete story about the connection between the variables in the model, we have decided to run further an Impulse Response Function (IRF). IRF model may show the response of one variable to a shock or an impulse in another variable in a system that involves some other variables as well. In other words, The IRF quantifies the reaction of every variable on an exogenous response in the model. The result of the impulse response function is presented in Fig. 1.

The initial response of agricultural export to economic growth is positive, and then diminish below the equilibrium in the second year, swiftly increases to reach the plausible direction in the third year. The response fluctuates over the years as it records adverse shocks in the second, fourth and eighth year.

A cursory examination of the impulse response of agricultural degree of openness to economic growth records negative only in 5th and 7^{the} year, all other years are positive but move up and down as time passes on. Likewise, the response from REER to economic growth also witnesses negative and positive shocks as years passes on. REER raises economic growth rates for the second year, but also fluctuate reaching below and above equilibrium levels over the periods (Fig. 1).

Statistically speaking, while IRF traces the effects of a change to another endogenous variable on to other variables in the VAR environment, Variance Decomposition Analysis (VDA) separates the variation in an endogenous variable into the component shocks in the model. Consequently, the VDA provides information about the relative relevance of each random innovation in affecting the variables in the VAR model.

The VDA results for the selected variables over a 10-year horizon are presented in Appendix D. The results reveal that economic growth variable was 100% explained by its shock in the first year, but it steadily reduces to 38% in the long run (10th year). The shocks further show that agricultural exports (20%), the agricultural degree of openness (17%), and REER (25%) account for the fluctuations in the economic growth in the long- run. Moreover, the findings confirm that agricultural degree openness (58), followed by agricultural exports (57%) and

REER (32) account for its own shock in the long term (10th-year horizon).

To conclude this study, our research does support the hypothesis that agricultural export-led economic growth in Nigeria. The negative relationship between the agricultural degree of openness and economic growth (Tab. III) is an indication that the country is importing more than it is exporting (Tab. I and II). Over-reliant on agricultural imports suggests hurting the Nigeria's economy.

CONCLUSION

Agriculture is the backbone of Nigeria's socioeconomic development as it serves as a catalyst for employment generation and major non-oil foreign exchange earner. The study uses OLS regression, Granger Causality, IRF and VDA approaches. OLS regression results show that agricultural exports-led economic growth in Nigeria. On the contrary, the results reveal an inverse relationship between the agricultural degree of openness and economic performance in Nigeria. The unfavourable balance of trade in agriculture may well be the reason for the negative result. This further confirms a bidirectional causality running from agricultural exports to economic growth in the country. Feedback causality is also believed to be running from REER rate to economic growth in the country. The VDA result implies that the volatility of GDP growth rate is caused by the exogenous variables in the model.

We finally conclude that our study does support the hypothesis that agricultural export-led economic growth in Nigeria. On the other hand, over-reliance on agricultural imports may well hurt economic growth in the country. For Nigeria to experience favourable trade balance in agricultural trade, the domestic agro-processing sector should be encouraged while imports of agricultural commodities that Nigeria could cheaply process at home should be discouraged. This could reduce the country from over-reliance on foreign food and increase the rate of agricultural production for self-sufficiency, export and economic growth in the country.

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REFERENCES

ANDERSON, K. and MARTIN, W. 2005. *Agricultural trade reform and the Doha development agenda*. World Bank Policy Research Working Paper 3607. Washington, D.C.: World Bank.

ANOWOR, O. F., UKWENI, N. O. and MARTINS, I. 2013. The impact of trade liberalisation on Nigeria agricultural sector. *Journal of Economics and Sustainable Development*, 4(8): 14–24.

BALASSA, B. 1978. Exports and economic growth: further evidence. *Journal of Development Economics*, 5(2): 181–89.

BBAALE, E. and MUTENYO, J. 2011. Export composition and economic growth in Sub-Saharan Africa: A panel analysis. *Consilience: The Journal of Sustainable Development*, 6(1): 1–19.

BOLTHO, A. 1996. Was Japanese growth export-led? *Oxford Economic Papers*, 48(3): 415–32.

CENTRAL BANK OF NIGERIA. 2014. *Statistical bulletins 2013*. Abuja: *CBN*.

CHENERY, H. B., and STROUT A. M. 1966. Foreign assistance and economic development. *The American Economic Review*, 6(1): 679–733.

DAWSON, P. J. 2005. Agricultural exports and economic growth in less developed Countries. *Agricultural Economics*, 33(2): 145–152.

DICKEY, D. A., and FULLER, W. A. 1979. Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74(366): 427–431.

EROKHIN, V., IVOLGA A. and HEIJMAN, W. 2014. Trade liberalization and state support of agriculture: effects for developing countries. *Agricultural Economics – Czech*, 58(11): 354–366.

FAO. 2013. *FAOSTAT database*. [Online]. Available at: http://bit.ly/NmQzZf. [Accessed: 2015, July 12].

FARIDI, M. Z. 2012. Contribution of agricultural exports to economic growth in Pakistan. *Pak. J. Commer. Soc. Sci.*, 6(1): 133–146.

GBAIYE, O. G., OGUNDIPE, A., OSABUOHIEN, et al. 2013. Agricultural exports and economic growth in Nigeria (1980–2010). *Journal of Economics and Sustainable Development*, 4(16): 1–4.

GRANGER, C. W. J. 1969. Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, 37(3): 424–438.

GRANGER, C. W. J. and NEWBOLD, P. 1974. Spurious regression in econometrics. *Journal of Econometrics*, 2: 111–120.

HENNEBERRY, D. M., and CURRY, K. 2010. Agricultural import demand in large markets: An aggregate analysis with high and low growth subgroups. *Journal of Food Products Marketing*, 2(3): 67–87.

HENRIQUES, I. and SADORSKY, P. 1996. Export-led growth or growth-driven exports? The Canadian case. *Canadian Journal of Economics*, 29(3): 541–55.

IJIRSHAR, V. U. 2015. The empirical analysis of agricultural exports and economic growth in

Nigeria. *Journal of Development and Agricultural Economics*, 7(3): 113–122.
KANG, H. 2015. Agricultural exports and economic growth: Empirical evidence from the major rice exporting countries. *Agricultural Economics – Czech*, 61(2): 81–87.
KAVOUSSI, R. M. 1984. Export expansion and economic growth: Further empirical evidence. *Journal of Development Economics*, 14(1): 241–250.
KÓNYA, L. 2004. Export-led growth, growth-driven export, both or none? Granger causality analysis on OECD countries. *Applied Econometrics and International Development*, 4: 73–94.
KUGLER, P. 1991. Growth, exports and Cointegration: An empirical investigation. *Weltwirtschaffliches Archive*, 127(1): 73–82.
LABORDE, D., MARTIN, W. 2012. Agricultural trade: what matters in the Doha round? *Annual Review of Resource Economics*, 4: 265–283.
MARSHALL, H., SCHWART, M. and ZILIAK, J. P. 1988. Agricultural specialization and economic growth. *Sociological Focus*, 21(2): 113–126.
MCCALLY, A. F., and NASH, J. 2007. *Reforming agricultural trade for developing countries: Volume one: Key issues for a pro-development outcome of the Doha Round*. Washington, D.C.: World Bank.
MICHAELY, M. 1977. Exports and growth: An empirical investigation. *Journal of Development Economics*, 4: 49–53.
OJIDE, M. G., OJIDE, K. C. and OGBODO, J. C. 2014. Export-led growth hypothesis in Nigeria: Applications of ARDL model and co-integration analysis. *Global Journal of Emerging Market Economies*, 6(1): 5–13.
OJO, E. J., AWE I. T., OGUNJOBI, J. O. 2014. Agricultural export and economic growth in Nigeria: A multivariate Johansen cointegration analysis. *International Journal of Arts and Commerce*, 3(3): 89–98
ONOGWU, G. O. 2014. Determinants of the intra-industry trade in cereal and miscellaneous edible preparations: The evidence for Nigeria and the ECOWAS partners. *Agricultural Economics – Czech*, 60(1): 21–30.
OSAKWE, C. N., VERTER, N. and DARKWAH, S. A. 2015. An empirical analysis of the impacts of external capital inflows and world oil price on Africa's 'largest' market. *WSEAS Transactions on Business and Economics*, 12(41): 433–440.
PHILLIPS, P. C. B. and PERRON, P. 1988. Testing for a unit root in time series regression. *Biometrika*, 75(2): 335–346.
RAM, R. 1985. Exports and economic growth: Some additional evidence. *Economic Development and Cultural Change*, 33(2): 415–425.
SANJUÁN-LÓPEZ, A. and DAWSON, P. J. 2010. Agricultural exports and economic growth in developing countries: A panel cointegration approach. *Journal of Agricultural Economics*, 61(3): 565–683.
SHIRAZI, N. S. and MANAP, A. A. 2005. Export-led growth hypothesis: Further econometric evidence from South Asia. *The Developing Economies*, 43(4): 472–488.
SHOMBE, N. H. 2008. Causality relationships between total exports with agricultural and manufacturing GDP in Tanzania. Institute of Development Economies, Discussion paper No. 136.
TARAWALIE, A. B. 2010. Real exchange rate behaviour and economic growth: evidence from Sierra Leone. *South African Journal of Economic and Management Sciences (SAJEMS)*, 13(1): 8–25.
TYLER, W. G. 1981. Growth and export expansion in developing countries: Some empirical evidence. *Journal of Development Economics*, 9(1): 121–30.
UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT. 2015. *World statistical database*. [Online]. Available at: http://bit.ly/1CK9hmK. [Accessed: 2015, July 17].
VERTER, N. 2015. The application of international trade theories to agriculture. *Mediterranean Journal of Social Sciences*, 6(6): 209–219.
VERTER, N. and BEČVÁŘOVÁ, V. 2014. Analysis of some drivers of cocoa export in Nigeria in the era of trade liberalization. *Agris On-Line Papers in Economics and Informatics*, 6(4): 208–218.
VERTER, N. and OSAKWE, C. N. 2015. Market competitiveness of the Czech economy in the era of globalization: Some new empirical insights. *Mediterranean Journal of Social Sciences*, 6(1): 268–277.
WORLD BANK. 2015. *World development indicators 2015*. Washington, D.C.: World Bank.

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Appendix

Appendix A. ADF and PP unit root tests

Variable	Levels	ADF test Statistics	PP test Statistics
RGDPG	Level	–3.6842	–3.6896
QAX	Level	–0.6252	–1.1780
	First difference	–7.9779	–7.9926
ADO	Level	–1.3931	–1.4028
	First difference	–7.9779	–5.6977
REER	Level	–2.6088	–1.8880
	First difference	–3.8417	–3.8290

Note: McKinnon (1991) critical values are: –2.619 for 10%, –2.940 for 5% and –3.661 for 1% level

Appendix B. Diagnostic test

Test	Test- statistic	P. value
Ramsey's RESET	1.1158	0.3430
White's test for heteroskedasticity	12.5188	0.1856
Breusch-Pagan test for heteroskedasticity	1.3175	0.7250
Test for normality of residual	2.3567	0.3078
Breusch-Godfrey test for first-order autocorrelation	2.0867	0.0984
Ljung-Box Q' test for first-order autocorrelation	10.7803	0.0954
Test for ARCH of order 1	1.0880	0.2970

Appendix C. VAR lag order selection criteria: Endogenous variables: D(RGDPG) D(AX) D(ADO) D(REER)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	–450.6006	NA	1.49e+09	32.47147	32.66178*	32.52965
1	–436.0570	23.89303	1.68e+09	32.57550	33.52707	32.86641
2	–420.1834	21.54276	1.83e+09	32.58453	34.29736	33.10816
3	–406.8294	14.30780	2.74e+09	32.77353	35.24763	33.52989
4	–363.9420	33.69726*	6.42e+08*	30.85300*	34.08835	31.84208*

Note: * indicates lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, and HQ: Hannan-Quinn information criterion

Appendix D. Estimates of variance decomposition analysis

Variance Decomposition of D(RGDPG):					
Period	**S.E.**	**D(RGDPG)**	**D(AX)**	**D(ADO)**	**D(REER)**
1	3.464711	100.0000	0.000000	0.000000	0.000000
2	4.233464	91.19058	8.286669	0.488066	0.034684
3	4.309712	87.99534	10.86150	0.591559	0.551599
4	6.280574	45.21125	17.86044	15.33061	21.59770
5	7.180807	36.09913	18.07264	16.08761	29.74062
6	7.348493	38.48100	17.53943	15.54273	28.43685
7	7.615761	38.36927	16.83894	17.78939	27.00240
8	7.681102	38.61269	16.58016	17.90731	26.89984
9	7.948299	37.51149	19.50500	16.97444	26.00907
10	8.084822	38.08449	20.11659	16.50104	25.29788
Variance Decomposition of D(AX):					
Period	**S.E.**	**D(RGDPG)**	**D(AX)**	**D(ADO)**	**D(REER)**
1	11.82768	20.13277	79.86723	0.000000	0.000000
2	15.28591	25.54930	64.67943	7.424684	2.346588
3	16.67532	22.52800	61.19142	11.64819	4.632396
4	17.04739	23.27015	58.77316	13.47645	4.480245
5	17.28928	22.78390	58.31064	13.93177	4.973690
6	17.41006	22.54460	57.96894	14.00423	5.482229
7	17.55206	22.18906	57.34473	14.15991	6.306302
8	17.66882	22.18527	56.86815	14.32244	6.624140
9	17.75013	22.26334	56.87816	14.20177	6.656727
10	17.90132	21.88917	56.60059	14.28849	7.221753
Variance Decomposition of D(ADO):					
Period	**S.E.**	**D(RGDPG)**	**D(AX)**	**D(ADO)**	**D(REER)**
1	6.480103	17.47249	0.210526	82.31698	0.000000
2	6.928427	17.19057	2.204593	78.05839	2.546442
3	7.061734	17.88358	2.635062	75.18982	4.291529
4	7.805187	14.83811	5.885270	63.53172	15.74490
5	8.309613	13.09299	6.097706	66.89265	13.91666
6	8.561322	14.07098	8.781212	63.54271	13.60510
7	8.760976	14.29887	10.74110	61.52406	13.43597
8	8.987642	14.22310	14.09943	58.73618	12.94129
9	9.312018	15.24721	14.60240	57.97081	12.17958
10	9.342940	15.33041	14.77631	57.59350	12.29978
Variance Decomposition of D(REER):					
Period	**S.E.**	**D(RGDPG)**	**D(AX)**	**D(ADO)**	**D(REER)**
1	58.66479	8.439736	22.66975	8.619066	60.27144
2	66.40843	7.176645	34.68950	7.064996	51.06886
3	71.87829	15.52181	33.35472	7.448655	43.67482
4	74.01294	15.97925	31.47900	9.830710	42.71103
5	76.42417	16.41112	33.71043	9.815349	40.06310
6	80.62856	15.92007	37.80097	10.28499	35.99398
7	82.08486	15.37405	39.64308	10.16539	34.81749
8	84.26959	16.34629	39.57730	10.84699	33.22943
9	86.48636	15.59856	39.15687	13.22357	32.02099
10	86.69332	15.79004	39.02398	13.23259	31.95339
Cholesky Ordering: D(RGDPG) D(AX) D(ADO) D(REER)					