AGRICULTURAL EXPORT AND ECONOMIC GROWTH IN NIGERIA: A MULTIVARIATE JOHANSEN COINTEGRATION ANALYSIS

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ABSTRACT
This paper analyzed the relationship between agricultural export and economic growth in Nigeria. The study made use of time series data covering the period between 1980 and 2012. The research model was specified in the spirit of Hwa (1988). Phillips-Peron unit root, multivariate Johansen cointegration and error correction techniques were used to estimate the stationarity, the long-run and the short-run dynamics of the research models respectively. The empirical findings in the study revealed that agricultural export, agricultural output, net capital flow and world price of Nigeria's major agricultural commodities are long run determinants of economic expansion in Nigeria. The paper recommended that government should direct efforts to improve agricultural export in the process of economic growth in the country.

Keywords: Agricultural Export, Economic Growth, Phillips-Perron unit root, Multivariate Johansen cointegration, error correction model.

I INTRODUCTION

Considering the location of Nigeria on the global spectrum and its associated climatology, it is not surprising to find the country endowed with an expansive fertile agricultural land, numerous rivers, steams and lakes, forest of varying types and grasslands. According to Njiforti (2007) and Adubi (1996), these resources create an impression which indicates that if these enormous resources are well managed and maintained, there could emerge in the country, a vibrant agricultural sector supportive of food and raw materials self-sufficiency for the large population and industrial sector respectively.

As observed by Abiodun and Solomon (2010), agricultural export was the mainstay of the Nigerian economy prior to the discovery, exploitation and exportation of crude petroleum and the resulting total dependence on its revenue for economic sustenance. This was the situation prior to the oil boom of the early 1970s when the contribution of agricultural exports (cocoa, rubber, palm oil, palm kernel, cotton, etc.) fell to 35% of the GDP from an average of 72% between 1955 and 1969.

As emphasized by Ekpo and Egwaikhide (1994), Nigeria was also ranked very high in the production and exportation of some major crops in the world in the 1940 and 1950s. Available statistics indicate that in 1960, agricultural export commodities contributed well over 75% of total annual merchandise exports. In the same direction, Abolagba, Onyekwere, Agbonkpolor and Umar (2010) emphasized further that agriculture has been the most important single activity in the Nigerian economy with about 70% of the total working population engaged in it before the advent of oil. But in the recent time, according to Daramola, Ehui, Ukeje and Mclntire (2007), agriculture, the second largest sector after oil, fell from 48 percent of GDP in 1970 to 20.6 percent in 1980 and was only 23.3 percent of GDP in 2005. According to him, agricultural exports only represented about 0.2 percent of total exports in 2005 in Nigeria.

We observed that Ricardo in his Principles of Political Economy and Taxation underscores the contribution of agriculture to capital formation. Hence, a limitation on the growth of agricultural output sets the upper limit to the growth of non-agricultural sector and capital formation for economic expansion.

In Nigeria, considerable efforts have been made by succeeding governments in terms of adopting policies and programme to influence the level of agricultural productivity and to attain specific objectives in the various roles expected of the sector. The average agricultural target growth set through the National Economic Empowerment Development Strategy (NEEDS) between 2003 to 2007 is 6.2%. This target was expected to be achieved through the various pricing and rural development policies, programmes and projects put in place by the federal government. Despite these laudable efforts, Nigeria's agricultural sector is still characterized by low yields, attributable to the use of crude implements, low level of inputs and limited areas under cultivation among others. It is important to consolidate the non-oil diversification strategies by identifying feasible ways through which growth in agricultural output can be stimulated which other things being equal will stimulate export. This emphasy leads us to the analysis of the problem and objectives of this study.

(a) Statement of the Research Problem.

Although several studies have outlined the theoretical relationship between agriculture and economic growth, disagreements still persist. The causal dynamics between agriculture and economic growth is an empirical question worthy of further investigation. In a critique of previous empirical analyses on the role of agriculture in economic-growth, Tsakok and Gardner (2007) argue that most early studies based on econometric investigation of cross-sectional data for a panel of countries have significant limitations and have not provided definitive results. Specifically, some earlier time studies like Ekpo and Egwaikhide (1994) made use of ordinary least square (OLS) and simple correlation coefficient tests and failed to account for the detail dynamics time series properties. A major short-coming in most of the previous studies is that they presented that the variables the used are stationary. The recent development in the field of econometrics showed that the inferences drawn from such regressions are unreliable if the variables are not stationary (Gujarati and Dawn, 2009).

The relevant outstanding questions that have motivated the researchers to this study are as follow: How agricultural export contributed to the economic growth in Nigeria? Is there any long run relationship between economic growth and agricultural export in the country? What is the state of short run relationship between the agricultural export and output expansion in Nigeria? These are some of the questions to be

addressed in this paper. In the light of bridging the existed gaps, this study shall test for stationarity of the time series properties and employ appropriate techniques to justify the objectives of the study.

(b) Objectives of the Study.

The broad objective of the study is to assess the relationships that exist between agricultural export and economic growth in Nigeria (1982-2012).

The specific objectives are to:

(i) examine the long run relationship between agricultural export and output expansion in Nigeria.

(ii) assess the significant and dynamic short run relationship between agricultural export and output growth in the country

(c) Statement of the Research Hypotheses

The following are the null hypotheses for the study:

(i) There is no long run relationship between agricultural export and economic growth in Nigeria.

(ii) There is no dynamic disequilibrium between agricultural export and economic growth in the country.

The remaining part of the paper is organized as follows: Section II discusses the literature review while Section 3 describes the econometric methodological issues. Section 4 presents results and discussion of findings and Section 5 contains the concluding remarks.

II CONCEPTUAL AND EMPIRICAL LITERATURE

In agreement with the theory of international trade by Adams Smith, no country can supply all her needs directly from the labour of her own citizens. This brings about exportation and importation of goods and services from one country to another. Export generally plays an important role in the economic growth and development of most developing countries. It has a great impact on major economic aggregates such as gross domestic product (GDP), government revenue, foreign exchange earning and external reserves. Agricultural subsector has contributed greatly to the total GDP and to non oil GDP in Nigeria. According to the Central Bank of Nigeria (2003), the contribution of agricultural GDP to total GDP increased from 28.26% in 1981 to 34.62% in 2003. Equally, agricultural share of non oil gross domestic product rose from 43.86% in 1981 to 54.09% in 2003.

Oji-Okoro (2011), stated that agricultural sector is the largest sector in the Nigerian economy with its dominant share of the GDP, employment of more than 70% of the active labour force and the generation of about 88% of non-oil foreign exchange earnings. Its share of the GDP increased from an annual average of 38% during 1992 to 1996 to 40% during 1977-2001.

From the analysis of Harold, Spitze and Allen (1994), export of agricultural commodities was much more widely spread amongst the tropical Africa countries. Generally, the rise of agricultural export has been a considerable success story and one that has brought numerous benefits to Africa. Substantial agricultural export is usually a rational policy for enlarged foreign exchange earnings in the non-oil sector in most developing countries (Longe, 2008).

Generally, the agriculture sector contributes to the development of an economy in four major ways-product contribution, factor contribution, market contribution and foreign exchange contribution (Abayomi, 1997; Abdullahi, 2002; World Bank, 2007). However, in 1970s till date, agriculture's contribution has been negligible, contributing 34 percent in the year 2006 to GDP (Central Bank of Nigeria, 2007). As a result of this decline in the percentage contribution to GDP, there have been a lot of measures in terms of programmes, strategies and policies to remedy the worsening situation in Nigeria. For example in 1976,

Operation Feed the Nation (OFN) programme was launched to encourage the people to pay greater attention in mobilizing internal resources for domestic agricultural production. This programme did not make any significant impact in increasing food production and GDP. It however increased awareness on the need for increased food production (Obadan, 1990). In 1980, Green Revolution Programme (GRP) was launched to replace OFN, with the aim of food sufficiency in agricultural food production and reducing import food price inflation. This programme again failed to impact on GDP and could not achieve its aims and objectives.

With the introduction of structural adjustment programme in 1986, a lot of policy packages and programmes were introduced such as World Bank-assisted Agricultural Development Project (ADP), Directorate of Food, Roads and Rural Infrastructures (DFRRI), and National Agricultural Land Development Authority (NALDA). In addition to these programmes a lot of schemes such as River Basin Development Authority were introduced. All these measures aimed at increasing agricultural production had little success in northern Nigeria but failed in southern part of the country (Abayomi, 2006).

III THEORETICAL FRAMEWORK

Endogenous growth theory is a new theory which explains the long-run growth rate of an economy on the basis of endogenous factors as against exogenous factors of the neoclassical growth theory. It extended Solow-Swan growth model by introducing endogenous technical progress in growth process.

One of the simplest versions of endogenous model is AK model. The AK model is a special case of Cobb-Douglas production function with constant returns to scale (Wikipedia, 2013):

$Y = AK^{\alpha}L^{1-\alpha}$……. (1)

Where: Y = Total production in an economy.

A = Total factor productivity.

K = Capital

L = Labour

α = Parameter between 0 and 1.

For the special case in which α = 1, the production function becomes a linear function of capital. Thus:

$Y = AK$ …….. (2)

Where A is the level of technology which is positive constant and k represents volume of capital, which embodies both physical capital and human capital.

Various extension of the basic AK endogenous growth model have been worked out, allowing different forms of variables to be productive (Hwa, 1988); various forms of expenditure (Gomez, 2008) and various forms of taxation (Ortigueira, 1998).

In his own contribution, Hwa (1988) argues that agriculture is an engine of growth and added agricultural output (O) to growth equation. Similarly, Hwa (1988) and Barro and Lee (1994) included additional determinants of growth [exports (X) and inflation rate (P)] that have been found to be robust in explaining aggregate productivity growth. The authors assumed B to be productive input in growth model. Thus, equation 2 becomes:

$Y = AK^{\alpha}B^{\beta}$ …… (3)

Where: B = f(O, X, P),

$\therefore \quad Y = AK^{\alpha}O^{\beta}X^{\delta}P^{\phi}$ …… (4)

Where: α, β, δ and ϕ are parameters to be estimated. Taking natural logs of equation (4) in order to convert research data from rates and absolute terms into the same numerical structure and to standardize them in relative growth rates and including an error term at time t, yields:

$$\ln Y_t = a_t + \alpha \ln K_t + \beta \ln O_t + \delta \ln X_t + \phi \ln P_t + \varepsilon_t \text{ .... } (5)$$

Where: ε_t = error term.

Agricultural export expansion can be a catalyst for output growth both directly, as a component of aggregate output, as well as indirectly through efficient resource allocation, greater capacity utilization, exploitation of economies of scale, and stimulation of technological improvement due to foreign market competition (Helpman and Krugman 1985; Awokuse, 2008). Also, agricultural productivity and export expansion are expected to have positive effects on growth while macroeconomic instability, captured by high inflation rates, should have a negative effect on economic growth.

IV METHODOLOGY

(a) Estimation and Analytical methods.

To carry out the objectives of this paper, we made use of Phillips-Peron unit root test to ascertain the degree of stationary of variables employed in the study. The objective of the long run relationship testing can not be achieved in the absence of cointegration technique. Johansen cointegration technique was employed in this study.

Given a cointegration situation, that is, a long-run relationship between variables, there is always a probability of disequilibrium in the short-run (Gujarati, 2009). To capture the short-run dynamics of our research series in this paper, error correction model was estimated.

Johansen's methodology takes its starting point in the Vector Auto Regression (VAR) of order p given by:

$$Y_t = \mu + \lambda_1 Y_{t-1} + \lambda_2 Y_{t-2} + \text{.....................} + \lambda_k Y_{t-k} + e_t \text{ .... } (6)$$

This VAR (equation 6) can be re-written in dynamic form as:

$$\Delta Y_t = \mu + \sum_{i=1}^{k} \lambda_i \Delta Y_{t-i} + e_t \text{ .... } (7)$$

Where: Y_t is a $p \times 1$ vector (many rows, one column) of integrated variables in a model, λ_k is a $p \times 1$ matrix of parameters, e_t is a px1 vector of stochastic term and p is the number of rows in a matrix ($p \times 1$ = total elements of column vector).

The matrix λ contains information about the long-run properties of the model. If λ has rank zero (r=0), where r is the number of cointegrating relationships, then the system is not cointegrated. If λ has rank p (r=p, i.e. full rank), all the variables in Y_t are stationary and are all cointegrated, indicating a long-run relationship between the research variables.

In the literature (Oseni and Onakoya, 2012), error correction term is defined by:

$$e_t = Y_t - \beta X_t, \text{ .... } (8)$$

Where: β is a cointegrating coefficient. (long-run parameter) and e_t is the error from a regression of Y_t on X_t. Then ECM is simply defined as:

$$\Delta Y_t = \alpha e_{t-1} + \gamma \Delta X_t + u_t \ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Where: u_t is iid (a white noise error term), e_{t-1} is the equilibrium error (or disequilibrium term) occurred in the previous period, α and γ are short-run parameters. The ECM equation (9) simply says that ΔY_t can be explained by the lagged e_{t-1} and ΔX_t. If the latter is non-zero, then the model is out of equilibrium. In other word, if ΔX is zero and e_{t-1} is positive, then Y_{t-1} is above its equilibrium value and the value will start falling in the next period to correct the equilibrium error, hence the name Error Correction Mechanism (ECM). Error correction approach is a means of reconciling the short-run behavior of an economic variable with its long-run behavior (Gujarati and Dawn, 2009).

The estimation of the unit root, cointegration and error correction models were carried out by the use of Econometric Views (7.0) software package.

(b) Data Issues and model Specification

Given the nature of the research work, secondary data are needed to carry out the empirical analysis and these were sourced from Central Bank of Nigeria (CBN) statistical bulletins (various Issues).

The data set used in the analysis consists of annual observations over 1982 to 2012. Although the key relationship of interest is that between economic growth and agricultural export, three additional control (exogenous) variables were included in the research model. The model estimated in the paper is adopted from the work of Hwa (1988), which is an extension of AK endogenous growth equation. Thus:

$$InGDP_t = \beta_o + \beta_1 InAEX_t + \beta_2 InNCF_t + \beta_3 InAOP_t + \beta_4 InWPA_t + e_t \ldots.. (10)$$

Where: GDP = Gross Domestic Product at current factor cost, AEX = agricultural export value (₦'M), NCF = Net capital flow, AOP = agricultural output (1000 tonnes), and WPA = World price of Nigeria's major agricultural commodities (₦/tonne). While e_t is the random error term, β_o and β_{1-4} are the intercept and slope co-efficients respectively.

V. RESULTS AND DISCUSSION OF FINDINGS

The first step in the estimation of the agricultural export model is the examination of the nature of the data series. Consequently, a test of time series properties of the variables of the model is performed. This is followed by a cointegration tests and error correction model estimation. The results of these various test are presented below:

(a) Unit root test result:

Phillip Peron (pp) test was carried out to test the order of integration of time series property of the study. The stationary test according to Nyong (2003), replaces the use of lags in the Augmented Dickey Fuller (ADF) unit root test which has been arbitrary. Phillips-Perron test is an improvement of the ADF test for that it uses non-parametric statistical methods to take care of the serial correlation in the error terms (Gujarati and Dawn, 2009). The results of the unit root tests are reported in Table 1 below. The results were regarded as non-stationary at their levels, since the reported pp statistic for each of the variables is less negative (i.e. greater) than the critical t-value at 5% and 10% levels of significance. A further test for the unit root was made and the report confirmed that all variables in the research model that were non-stationary at levels were made stationary at their first difference. That is, all variables are integrated of order one, I (1). Since all series are integrated of the same order, a necessary condition for co-integration test analysis is met.

Table 1: Phillip-Perron Unit Root Tests Result.

Series	PP Statistics		Critical Values		Prob. Levels		Order of Integration
	Levels	1st Diff.	5%	10%	Levels	1st Diff.	
GDP	2.602026	-3.729367	-2.960411	-2.619160	1.0000	0.0087	I(1)
AEX	-0.531991	-10.51623	-2.960411	-2.619160	0.8716	0.0000	I(1)
NCF	-2.413791	-13.59119	-2.960411	-2.619160	0.1463	0.0000	I(1)
AOP	1.379586	-5.933063	-2.960411	-2.619160	0.9985	0.0000	I(1)
WPA	-1.771238	-5.230684	-2.960411	-2.619160	0.3871	0.0002	I(1)

Source: Authors' computation. February, 2014 using E-view 7.0

(b) Cointegration tests.

Cointegration test was estimated with lag length of 1, using Juselius Johansen cointegration technique. Unrestricted cointegration rank test with no intercept or trend in cointegrating equation (CE) resulted with trace statistics indicating 5 cointegrating vectors and maximum eigenvalue statistics also indicating 5 cointegrating vectors at 5% significance level. The result of the Johansen cointegration test is as shown below:

Table 2: The Trace and Maximum Eigenvalue Tests for lnGDP, lnAEX, lnNCF, lnAOP and lnWPA.

Hypothesized No of cointegrating equations (CEs) (i.e. Null Hypothesis)	Trace Value	5% Critical Value	Prob. Level
None* (r=0)	93.60693	88.80380	0.0215
At most 1 (r≤1)	55.00860	63.87610	0.2218
At most 2 (r≤2)	30.59869	42.91525	0.4671
At most 3 (r≤3)	14.53375	25.87211	0.6134
At most 4 (r≤4)	3.499168	12.51798	0.8127
Hypothesized No of CEs (i.e. Null Hypothesis)	Max-Eigen Value	5% Critical Value	Prob. Level
None* (r=0)	38.59833	38.33101	0.0466
At most 1 (r≤1)	24.40991	32.11832	0.3222
At most 2 (r≤2)	16.06494	25.82321	0.5389
At most 3 (r≤3)	11.03458	19.38704	0.5098
At most 4 (r≤4)	3.499168	12.51798	0.8127

Source: Authors' Computation, February, 2014 using E-View 7.0
* denotes rejection of the hypothesis at the 5% level.

From the above Table 2, trace statistics indicated 1 cointegrating vectors (equation) since at the null hypotheses of cointegration rank (r=0), the trace value of 93.6069 is greater than the 5% critical values of 88.8038. The max-eigen statistics also indicated 1 cointegrating equations since the maximum eigenvalues of 38.5983 is greater than the 5% critical values of 38.3310.

The evidence of cointegration in the study indicates that, agricultural export, net capital flow, agricultural output and world price of Nigeria's major agricultural commodities are long-run determinants of economic growth in Nigeria. The result of the Johansen statistics of the residuals therefore rejects the null hypothesis of no co-integration between agricultural export and economic growth in Nigeria and conference that it could be used to make long-run prediction about economic growth in the country.

(c) Error Correction Estimate

The next move is to switch to short-run model with an error correction mechanism. Here, the model was estimated with two lags. The result of the estimation of the model is as shown in Table 3 below:

Table 3: Cointegrating Vector and Error Correction Estimates

	Cointegrating Equation (β)					Error Correction (α)				
C	β AEX (-1)	β NCF (-1)	β WPA (-1)	β AOP (-1)	β GDP (-1)	αAEX	αNCF	αWPA	αAOP	αGDP
-3099872	1.0000	-31.0518 (5.2832) [-5.8775]	-204.2328 (26.6840) [-7.6538]	9.2086 (9.9855) [0.9222]	6.8772 (4.4122) [1.5587]	0.0599 (0.0152) [3.9406]	0.0296 (0.0082) [3.6173]	-0.0004 (0.0011) [-0.3710]	0.0005 (0.0039) [0.1263]	0.0095 (0.0075) [1.2635]

Source**:** Authors' computation, February, 2014 using E-view 7.0
Standard errors in ( ), t-Statistics in [ ].

The model resulted with cointegrating vector β = (1.0000; -31.0518; -204.2328; 9.2086; 6.8772). The speed of adjustments coefficients were $\alpha_{AEX} = 0.0599$; $\alpha_{NCF} = 0.0296$; $\alpha_{WPA} = -0.0004$; $\alpha_{AOP} = 0.0005$; $\alpha_{GDP} = 0.0095$. The t-statistics for restrictions $\alpha_{AEX} = 0$, $\alpha_{NCF} = 0$, $\alpha_{WPA} = 0$, $\alpha_{AOP} = 0$ and $\alpha_{GDP} = 0$ are 3.9406, 3.6173, -0.3710, 0.1263 and 1.2635 respectively. Only the speed of adjustment coefficients for AEX and NCF have an empirical t-values exceeding theoretical value of 2.030 at 5%. Hence, AEX and NCF are strongly exogenous variables while WPA, AOP and GDP are weakly exogenous variables. Conclusively, the model has TWO variables that are not weakly exogenous and all variables with exception of WPA have positive signs, indicating a weak feedback in the system in the short run this shows that agricultural export has a promising long run relationship with economic growth but a significantly short run weak adjustment process in Nigeria during the period under review.

Table 4 below shows the dynamics of short run equilibrium behaviour among research variables. The table presents the coefficients, the standard errors and the t-values of the model variables.

Table 4: Cointegrating Variables Estimates.

Variables	Coefficient	Standard Error	t-statistics
C	12355.44	6563.83	1.8824
Δ AEX (-1)	0.1305	0.1194	1.0927
Δ AEX (-2)	-0.0618	0.1265	-0.4883
Δ NCF (-1)	0.0438	0.2060	0.2125
Δ WPA (-1)	2.7158	1.7554	1.5471
Δ AOP (-2)	1.2131	0.7083	1.7126
Δ GDP (-1)	0.6092	0.3671	1.6594
Δ GDP (-2)	-0.4801	0.3387	-1.4175

Source: Authors' computation. February, 2014 using E-view 7.0.

Interpreting across the row, the result shows that a 1% increase in 1 year lag of agricultural export (AEX) only lead to 0.13% change increase in economic growth (GDP) in Nigeria. At a year lag, a 1% increase in agricultural export leads to about 0.0% reduction in the Nigerian economy. The reason for this could have been for an increasing trend of inflation and exchange rates that could have effected the stability of the prices of agricultural export in the country. The result further confirmed that changes in the 2 years lag of agricultural outputs (AOP) motivated output expansion in Nigeria during the research period.

VI CONCLUSION AND RECOMMENDATIONS

The report of the study concluded that there was cointegration relationship between agricultural export and economic growth during the study period in Nigeria. The study indicated that agricultural export, net capital flow, agricultural output and world price of Nigeria's major agricultural commodities are long-run determinants of economic growth in the country. Based on the finding, we recommend as follow:

(a) A concerted effort should be directed toward productive channels of agricultural product in Nigerian economy so as to enhance sustainable economic growth through increased agricultural export.
(b) Government should put in place an appropriate policy mix to channel capital inflow toward agricultural output expansion in the process of increasing agricultural export to attain economic growth in Nigeria.
(c) The government should also activate her macroeconomic variables to enhance price stability of agricultural products in order to achieve agricultural export for economic expansion in the country.

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