REINVIGORATING THE NIGERIAN AGRICULTURAL SECTOR FOR GROWTH: DOES FOREIGN DIRECT INVESTMENT MATTER?

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ABSTRACT

The paper investigates the implication of inflow of foreign direct investment on the development of agricultural sector in Nigeria using data covering 1981 to 2015 published by Central Bank Nigeria in the 2016 statistical bulletin. The methodology employed in the study includes cointegration and vector error correction techniques. The stationarity properties of the series were examined. Except for AGY that was stationary at a level, FDI and BLR attained stationarity after first differencing, whereas MSS and GNS were stationary after second differencing. Equilibrium long-run relationship was established among the variables through the application of Johansen cointegration test. The parsimonious vector error correction model indicated a coefficient of -216663 which infers that the speed of adjustment to long run equilibrium relationship was significantly and statistically high. Nevertheless, FDI was not statistically significant in stimulating agricultural sector growth. Thus, the relevant government agencies need to lay an obdurate foundation to encourage domestic investors in agricultural ventures for a national self-recovery based on strong principles, competition and efficiency at all levels and sectors of the economy.

Keywords: Foreign Direct Investment, Rejuvenating, Agricultural Sector.
JEL CLASSIFICATION: E32, E51, F21

INTRODUCTION

Nigeria is sufficiently endowed with huge natural resources and large market size, with a population of about 220 million, which potentially qualifies the country as an attractive destination of foreign direct investment in quality and quantum. This vantage position could boost the country's capacity to sustain productive and profitable agricultural sector toward enhancing a robust and vibrant economy. The enormous resource base could elicit adequate support to agricultural sector to make it vibrant and self sufficient in food supply, provision of raw materials, and generating employment opportunities as well as spawning foreign exchange earnings by exporting raw, semi-processed, and processed agricultural produce.

The world economy has become increasing more integrated, with attendant upsurge in the inflow and outflow of investments, labour, and capital among developed and developing economies. Nigeria, straddled on vantage plain is one of the top three destinations of foreign direct investment in Africa in the past decades. Nevertheless the level of inflows to agricultural sector is infinitesimally low; hence the sector has consistently performed abysmally low and below its potentials. But in spite of this, agricultural sector remains the dominant sector of the nation's economy in terms of contributions to gross domestic product (GDP). Thus the sector contributed

an average of approximately 38.1 percent of the GDP between 1981 and 1989, 39.3 percent from 1990 to 1999, and 42 percent for the period ranging from 2000 to 2007 (Mordi, Englama, & Adebusuji, 2010) and employs about 70 percent of the working population (CIA, 2013).

The government over the years has initiated various incentives to encourage the inflow of foreign direct investment to relevant sectors of the economy, particularly the agricultural sector which has the capacity of employing a preponderance of youths, hence alleviating incidence of poverty. In spite of these policies, the inflow of FDI to agricultural sector remains infinitessimally low. Nevertheless, the inflows of FDI remain always irregular in pattern and skewed towards oil and gas industry, telecommunication and construction sectors. Furthermore, inconsistent shift in policy paradigm as well as high cost of funds in the financial market also contributed to the low level of capacity utilization and output.

Despite the efforts by the Nigerian government to fortify the Nigerian agricultural sector and to boost agricultural output coupled with rich agricultural resource endowment, the agricultural sector has been growing at a very low rate. Less than 50% of the country's cultivable agricultural land is under cultivation. Therefore, the resultant yield is very low and insignificant because the smallholders and the traditional farmers use rudimentary production techniques. The smallholder farmers are constrained by many problems, including poor access to modern inputs and credit, poor infrastructure, inadequate access to markets, land and environmental degradation, inadequate research and extension services.

From the perspective of increased FDI flow and sustainable agricultural growth in Nigeria, the most fundamental constraint is the peasant nature of the production system, with its low productivity, poor response to technology adoption strategies and poor returns on investment.

There has been a dramatic increase in the incidence and severity of poverty in Nigeria, arising in parts from the dwindling performance of the agricultural sector where a preponderant majority of the poor is employed. Furthermore, poverty in Nigeria has assumed wider and disturbing dimensions, including low household income, poor access to public services and declining infrastructure and so on. The key objective of this study is to establish the role of foreign direct investment (FDI) in promoting the growth of agricultural sector in Nigeria between 1981 and 2015. Time series data were collected from 2016 Central Bank of Nigeria Statistical Bulletin for this study.

Following from the introduction, the rest of the paper is structured as follows. In section two we briefly outline both theoretical issues and empirical literature of prior studies relevant to this work. In section three we consider data and specification of econometric methodology, and analyze the empirical results in section four, while conclusion of the study is made in section five.

THEORETICAL AND EMPIRICAL LITERATURE

Theoretical Foundation

There are plethora theories attempting to explain the rationale behind the involvement or engagement of multinational firms in transnational production. Hitherto, there had been no clear-

cut theory of the determinants of foreign direct investment, especially in developing economies. But there is now a significant body of economic theory on FDI. Most theoretical models on FDI and growth implications are found within the framework of industrial organization theory.

The dependency theory

The writings of the dependency school expounded the early theories of the impact of foreign capital flows and multinational firms on host countries. The dependency school theory considers foreign direct investment from the developed economies as the bedrock of the world economic system and as harmful to the long-term economic growth of developing nations out in the periphery. It considers that the penetration of peripheral economies by large companies allowed them to control resources that might otherwise been used for national development. The theory asserts that developed nations become wealthy by extracting cheaply material resources and labour from the developing nations. According to the theory, it views transnational production as capitalism which perpetuates a global division of labour that causes economic distortions, hampers growth, and increases income inequality in developing economies. Dependency theorists argue that developing economies are inadequately compensated for their natural resources and are thereby sentenced to conditions of perpetual and continuing poverty, and decay in infrastructure. Countries in the periphery cannot become fully modernized and developed as long as they remain in the capitalist world system. To liberate the third world economies out of this economically debilitating relationship, the third world nations must develop independently.

Although the debate on the validity spanned decades, the influence of the dependency theory peaked in the 1970s. For example, Bornschier and Chase-Dunn (1985) consider that the flows of foreign investment has short run positive effects on economic growth, but accumulated stock of foreign capital has a long term retardant effect on economic growth and is associated with greater income inequality. Firebaugh (1998) however rejected this claim. He maintains that studies that confirmed FDI harmful to poor nations have focused on the negative relationship between investment in capital stock ratio and the growth of per capita GDP. Firebaugh (1998) argues that since capital stock is the denominator for the investment rate, the greater the stock, the lower the investment rate for a given level of new investment. Therefore, the negative coefficient for the capital stock variable found in dependency studies does not indicate a harmful investment effect. Firebaugh (1998) finds that least developed countries with greater rates of foreign investment tend to exhibit faster rates of both long-run and short-run economic growth. The results of various studies largely curbed the popularity of the dependency theory, shifting attention to the contribution of FDI to growth.

The classical theory of growth

The first work on economic theory which addresses issues significant to economic growth is credited to Adam Smith (1776), who through his famous treatise ”An Inquiry into the Nature and Causes of the Wealth of Nations”, explains that output depends on the amount of input factors, i.e. capital, land, and labour. This is succinctly laid out in a simple production function as:

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

Where Y is output, L is labour, K is capital, and D is land. Therefore, output depends on labour, capital and land inputs. Furthermore, he posits that output growth (gY) is driven by population

growth (gL), growth in investment in capital stock (gK), growth in land (gD) as well as growth in overall productivity (gA). This relationship is expressed as:
gY = f(gA, gK, gL, gD)

According to the theory, population is endogeneous to the model and depends on the sustenance of the available capacity to accommodate the increasing work force. Investment in capital is also considered to be endogeneous and determined by the rate of savings, mostly by capitalists, whereas land growth was dependent on conquest of new lands, for example through colonialism or technological improvements of fertility of old lands. Technological progress was considered to increase growth in overall sense. A fundamental argument in the treatise was the significance of the division of labour, which improves growth through specialization. Improvement in machinery and transnational trade were also considered as engines of growth as they further facilitated specialization.

Division of labour is limited by the extent of the market, leading to economics of scale. As output (extent of the market) increases by specialization, it induces the possibility of further division of labour and thus further growth. Thus growth was argued to be self-regulating as it exhibits increasing returns to scale and results in optimum resource allocation.

Because savings made by capitalists induces investment and hence growth, therefore income distribution becomes one of the significant determinants of the rate of acceleration of the national economic growth. However, savings is partly influenced by the profits of stock. As capital stock of a country increases, profit declines due to competition of capitalists for workers which bids up wages, rather than decreasing marginal productivity.

PRIOR LITERATURE

While there are plethora of literature on the nexus between FDI and economic growth very little study has been conducted to estimate the role of FDI and agricultural sector development in Nigeria. However, economic recession which has resulted in price trudge and volatility has generated genuine anxiety about the future availability and security of food. This has caused personnel in policy circles to refocus on policies, programmes and plans that will promote increased FDI inflow to agricultural sector for development.

Performance of the Nigerian economy: Historical perspective

The Nigerian economy is a dual economy of modern segment and the traditional agricultural segment. The modern segment is dependent on oil earnings which are overlaid by the traditional segment of agriculture and trading (Thomas & Canagarajah, 2002). Nigeria attained independence in 1960 during which period agriculture accounted for well over half of the gross domestic product as well as being the main source of export earnings and public revenue. The oil sector emerged in the 1960s and firmly established in the 1970s. It has now assumed overwhelming importance. The oil sector provides 20% of GDP, 95% of foreign exchange earnings, and 65% of budgetary revenues (Dutse, 2008).

Agriculture had largely been subsistence with rapid population growth. Nigeria was one of the largest net exporters of agricultural produce. However, Nigeria now imports food and is being classified among the world's twenty poorest nations with low gross national product (GNP) per capita. Since early 1970s, growth in the economy has been erratic. This is primarily due to the fluctuations in the global oil market. This accounted for the growing economic decline encountered by Nigeria in 1980s and 1990s. During this period, the living standard was drastically falling, with attendant political instability, colossal corruption and dismal macroeconomic performance and management as well as failure to diversify the economy.

According to Thomas and Canagarajah (2002), the formal capital-intensive sector has few multinational firms, a multitude of small local industries, and a myriad of government parastatals operating in most areas of economic activity. Crises in the oil rich Niger Delta region has also negatively impacted on revenue due to un-programmed production cut. Furthermore, the global economic meltdown has plagued the performance of the domestic financial markets, exerting pressure on the limited resources.

Contributions of foreign direct investment to economic growth in Nigeria

Studies on investment and economic growth in Nigeria produce varying outcome. The empirical evidence is not unanimous, however. For instance, Odozi (1995) working on the determinants of FDI in Nigeria in periods pre and post Structural Adjustment Programme (SAP) discovers that the macro policies in place pre-SAP era inhibited the inflow of FDI. This policy environment resulted in the proliferation and growth of parallel exchange markets and sustained capital flight.

Ogiogio (1995) identifies distortions as reasons for negative contributions of public investment to GDP growth in Nigeria. Contrarily, other researchers, such as Aluko (1961) and Obinna (1983) identify positive significant nexus between FDI and economic growth in Nigeria. However, Endozien (1968) submits that though there are linkage effects of FDI and the Nigerian economy, he maintains that the relationship is positively negligible. According to Oseghale and Amonkhienm (1987), FDI is positively associated with GDP growth. In their conclusion, they submit that increased inflows of FDI results in better economic performance.

Ariyo (1998) examined the trend of investment and its consequences on long-term economic growth in Nigeria. He observes that private domestic investment only consistently contributes to higher GDP growth rates between 1970 and 1995. However, reliable evidence that all the investment variables included in the analysis have any perceptible influence on economic growth was lacking. He therefore, suggests the need for an institutional re-arrangement that recognizes and protects the interests of major partners, (such as foreign investors) in the development of the economy.

Jerome and Ogunkola (2004) examined the magnitude, direction and prospects of FDI in Nigeria. They note general improvement in FDI regime in Nigeria. They also observe some serious deficiencies. These deficiencies were found in the area of corporate environment (such as corporate laws, bankruptcy and labour laws, among others), and institutional uncertainty as well as the rule of law.

Oyaide (1977), using indices of dependence and development as mirror of economic performance in Nigeria, concludes that FDI catalyses both economic dependence and economic development. According to him, FDI continuously promotes a level of development that would have been impossible without such inward flows of investment albeit, at the cost of dependence.

Furthermore, Oseghae and Amenkheinan (1987), explored the nexus between oil exports, international debt and foreign direct investment in Nigeria on one hand, and the impact of this relationship on the sectoral performance, on the other hand. They surmise that foreign borrowing and FDI negatively influence overall GDP. However, they conclude that the variables generate significantly positive impact on three main sectors of the Nigerian economy, viz: manufacturing, transport, communication, insurance, and finance.

Oyinlola (1995) examined the contributions of foreign direct investment to the prosperity or poverty of least developed countries (LDCs). He conceptualized foreign capital to embrace foreign loans, foreign direct investment and export earnings. Adopting a two-gap model credited to Chenery and Stout (1966), Oyinlola (1995) conclude that FDI generates a negative effect on economic growth and development in Nigeria. However, Ekpo (1995) using time series data reports that political regime, real income per capita, rate of inflation, global interest rates, credit rating and debt service are the key factors responsible for the variability of FDI into Nigeria.

Adelegan (2000) explored the seemingly unrelated regression model to examine the impact of FDI on economic growth in Nigeria and observed that FDI is pro-consumption and pro-import and negatively related to gross domestic investment. Akinlo (2004) found that foreign capital has a negligible and not statistically significant effect on economic growth in Nigeria.

However, according to Ayanwale (2007), these studies did not control for the fact that most of the FDI is concentrated on the extractive industry (oil, gas and natural resources). Assessing the influence of FDI on firm level productivity in Nigeria, Ayanwale and Bamire (2001) report a positive spillover of foreign firms on domestic firms' productivity.

METHODOLOGY AND METHODS

The share of agricultural sector (AGY) to gross domestic product (GDP) was employed as a measure of agricultural sector revitalization. The value of the flow of foreign direct investment (FDI) to agricultural sector in Naira measures the degree of participation of foreign direct investors in agricultural sector. In the study we also incorporated broad money supply (MSS) in the model. MSS measures the degree of liquidity or monetization of the economy. Bank lending rate (BLR) provides information on the banking sector lending policy, which may or may not favour foreign investors when trying to meet their current obligations. Gross national savings (GNS) is also a choice variable which measures part of the borrowing capacity to finance investment.

MODEL SPECIFICATION

The production function that relates the growth (proxied by amount of agricultural output), to the changes in the determinants of the growth process (amount of inputs used in the production of that output) is expressed as:

$Y = f(X_1, X_2, X_3 \ldots\ldots\ldots\ldots\ldots X_n)$ ……(Eq. 1)

where Y = dependent variable, i.e. the agricultural growth proxied by the amount of agricultural output produced (i.e. AGY),

X_1--------Xn = explanatory variables, i.e. the n different determinants of output growth process (i.e. inputs used to make that output). The functional forms of a regression equation commonly used in estimating the precise mathematical equation for growth process are:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots + \beta_n X_n$

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_1^2 + \beta_3 X_2 + \beta_4 X_2^2 + \ldots\ldots\ldots + \beta_{2n-1} X_n + \beta_{2n} X^2_n$

$\sqrt{Y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots\ldots + \beta_n X_n$.

The above equations are the three different possible functional forms for the general form $Y = f(X_1, X_2, X_3 \ldots\ldots\ldots\ldots\ldots X_n)$ already expressed above, and usually applied for the calculation of residuals. Therefore, a common form of production functions used is the Cobb-Douglass functional form expressed as:

$Y = A \cdot X_1^{\beta 1} \cdot X_2^{\beta 2} \ldots\ldots\ldots\ldots\ldots X_n^{\beta n} \ldots\ldots\ldots\ldots\ldots$ (Eq. 2)

Re-parameterizing the model, the term A is replaced with the term β_0 to show that the A term is really the intercept term in the equation and does not vary across observations. The equation stated above is not linear because the parameters appear in the exponents of the equation. However, in econometric estimation, linear equations are commonly preferred. Nevertheless, the problem is normally resolved with the use of logarithms on both sides of the equation as expressed below:

$\text{Log } Y_t = \beta_0 + \beta_1 \log X_{1t} + \beta_2 \log X_{2t} + \ldots\ldots + \beta_n \log X_{nt}$. …… Eq. 3

Estimating the production/growth function, the general form is stated as below:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots\ldots + \beta_n X_n$ ……Eq. 4

From the multivariate model above, agricultural growth process (the amount of output produced) depends on growth determinants (input factors) X_1, X_2,……X_n, under consideration, as well as the passage of time. The number of parameters estimated is equal to n + 1: one for each variable, plus β_0, the intercept. β_0 is the value of Y if all X variables are equal to zero; and β_1 is the amount that Y will increase if X_1 rises by one unit, other X variables being held constant (Schmidt, 2005).

The neoclassical production growth model is specified as:

$Y = f(K, L)$…… Eq.5)

where Y(K, L) is a linear homogeneous function with the properties (K,L > 0), i.e. YL > 0 and YK > 0 (Chiang and Wainwright, 2005)

The coefficients in the model above can only be meaningful if expressed in production functional form, such as:

$Y = \beta_0 + \beta_1 K + \beta_2 M + \beta_3 B + \beta_4 G$……Eq. 6

where β_1 is the amount by which output growth (AGY), Y will improve if one unit of capital K (FDI) is utilized to enhance the growth process, while money supply, M (MSS), bank lending rate, B (BLR) and gross national savings G (GNS) employed are held constant. This corresponds to the economic concept of the marginal product of capital. Similarly, β_1 is the amount of FDI inflows. β_0 is the amount of output that will be produced if zero units of capital (FDI), zero units of MSS, zero units of BLR and zero units of GNS were utilized. The equation above is interpreted as follows:

Y = output (agricultural output growth)

K = physical capital (FDI)

M = Money supply in the economy

BLR = bank lending rate
GNS = gross national savings

The multiple regression technique specifying the relationship between the dependent and the independent variables is specified below:

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \ldots\ldots\ldots\ldots + \beta_nX_n + \varepsilon it$ …… Eq. 7

where β_1,……., βn are population regression parameters,
β_0 = regression constant or intercept, and εit = stochastic error term or variable with property of zero mean and non-serial correlation.

Applying neoclassical growth model, Labour (L) and capital (K) are required for growth or production process with capital from foreign sources, K_f in the form of FDI.

ECONOMETRIC TECHNIQUES

This study employs analytical structure which encompasses series of econometric framework that includes OLS regression analysis, unit root test to investigate the order of integration to ascertain the stationarity properties of the series. Furthermore, a cointegration test was conducted to ascertain the existence of cointegrating relationship between the variables. This is followed by the specification of error correction mechanism.

Unit Root Test

To circumvent unit root problem and ensure non-existence of stochastic non-stationarity in time series, Augmented Dickey Fuller (ADF) evaluation of the series was conducted to determine the order of stationarity of the individual series. This test was aimed at ascertaining the presence or absence of unit root. Following Seddighi, Lawler, and Katos (2000) the estimation involves any one of the three equations stated below:

$$\Delta X_t = \beta X_{t-1} + \sum_{J=1}^{k} \square_j \Delta X_{t-j} + u_1 \text{----------Eq. 8)}$$

$$\Delta X_t = \square_0 + \beta X_{t-1} + \sum_{J=1}^{k} \square_j \Delta X_{t-j} + u_2 \text{----------Eq. 9}$$

$$\Delta X_t = \square_0 + \square_{it} + \beta X_{t-1} + \sum_{j=1}^{k} \square_j \Delta X_{t-j} + u_3 \text{----------Eq. 10}$$

where u_1, u_2, and u_3 are pure white noise, and $\Delta X_{t-j} = (Y_{t\,1-}\, Y_{t-2})$,
$\Delta X_{t-2} = (Y_{t-2} - Y_{t-3})$, etc.

The lag length (lag difference terms) are included to ensure that the errors are serially uncorrelated and are examined in consideration of Akaike Information criterion (AIC) and Schawrz information Criterion (SIC). The non-hypothesis is hypothesized to be non-stationary series. This implies that $H_0 = 0$. The hypothesis of non-stationarity is rejected when β_0 is significantly negative. The inference is that $\beta_0 < 0$, and which further denotes that if the

calculated ADF is greater than Mckinnon's critical values, the null hypothesis is rejected and the time series considered stationary or integrated of order zero, 1(0) at a level. This further confirms that the series is not suffering from unit root. However, if the calculated ADF statistic is less than Mckinnon's critical values, the null hypothesis (H_0) is not rejected. This suggests that the time series is not integrated and suffers from unit root. This therefore, led to performing the test of differencing the time series until stationarity is attained, sometime in consideration of intercept and/or trend, and the null is rejected.

Johansen coointegration Test

This study also applies coointegration test which is based on Johansen and Juselius (1990) maximum likelihood framework that sets up the non-stationary time series as a Vector Auto Regressive (VAR) model aimed at ascertaining whether long run relationship exist among the variables in the model. The existence of long run relationship guarantees that the variables do not demonstrate any inherent tendency to drift apart. The VAR model of the order K is presented below:

$$\Delta\lambda_t = \square\lambda_{t-1} + \sum_{i-1}^{k-1} \square\, \Delta\lambda_t + \beta xt + u_t \text{----------Eq. 11}$$

$$\square > \sum_{k=1} A_{i-1,} \square = -\sum_{i-i+1}^{k} + Aj \text{----------....Eq. 12}$$

such that λ_t is K vector of 1(1) variables, X_t is a deterministic vector variable, r represents the number of cointegrating relations that are independently, but identically stochastic. The test is based on the trace test and maximum eigenvalue test. These two tests are used to confirm the hypothesis of the existence of r cointegrating vectors. The trace test statistic examines the null hypothesis that the number of distinct cointegrating vectors is less than or equal to r, (Ho ≤ r), against the general alternative, while the maximum eigenvalue test statistic examines the null hypothesis that the number of cointegrating vectors is r against the alternative of r+1 cointegrating vectors (Odeniran and Udeaja, 2010).

Specification of Error Correction Mechanism (ECM)

Having ascertained the existence of long run or equilibrium relationship among the variables, the specification of error correction mechanism (ECM) becomes necessary in order to capture the speed of adjustment to equilibrium in case of any shock to any of the explanatory variables. The error correction term specifies the equilibrium error which has the capacity to tie the short run dynamics or behavior of AGY, FDI, MSS, BLR, and GNS to their long run values. This process begins with the overparameterized vector error specification model expressed below:

$$\Delta AGY = \square_0 + \sum_{i=1}^{k-1} \square_1\, \Delta AGY_{t-1} + \sum_{i=0}^{k-1} \beta_1 \Delta FDI_{t-1} + \sum_{i=0}^{k-1} \square_1 \Delta MSS_{t-1} + \sum \lambda_1 \Delta BLR_{t-1}$$

K=1

$+\sum_{i=0}\Psi\Delta_1 BLR_{t-1} + \varphi 1ECM_{t-1}$ ---------- Eq. 13

where: Δ represents the first difference operator of the series, and $\square_0$, $\square_1$, β_1, $\square_1$, λ_1, φ_1 represent the expected coefficients or the parameters of the model. The number of lags for the first difference operator of both the dependent and the independent variables of the model is indicated as "1". The ECM_{t-1} is the lagged error correction term, while t is an indication of time horizon. U_{t-1} represents stochastic error term. φ is expected to be less than one, negative and statistically significant. When the ECM_{t-1} term is negative, this infers that there is a long run relationship among the variables and that there is a convergence of the model to equilibrium as well as explaining the proportion and the time it takes for the equilibrium to be corrected during each period in order to return the disturbed system to equilibrium (Adenuga, 2010).

The overparameterized error correction model usually is difficult to interpret in any meaningful way according to economic theory. Thus, to overcome this short-coming, the model was pruned down to a more conservatively preferred and interpretable parsimonious error correction one which provides assurance of data admissibility and clarity which is consistent with theory, by dropping non-significant variables that hitherto were included in the general and over-parameterized ECM.

EMPIRICAL RESULTS

This section presents and analyzes the results of unit root and cointegration tests, as well as interpreting the result obtained from parsimonious vector error correction specification in this study.

Table 1 Unit Root Test Results

	Levels		First Difference		Second Difference		Order of	Lag
Variables	ADF Statistics	Critical value	ADF Statistics	Critical values	ADF Statistics	Critical values	Integration	Length
AGY	-4.081826	-1.951687					1(0)	1
FDI	0.135031	-1.951687	-5.163509	-1.952066			1(1)	1
MSS	2.175137	-1.91332	0.300985	-1.951687	-3.715408	-0.952066	1(2)	1
GNS	0.926306	-1.951332	0.064077	-1.951687	-4.966395	-1.952066	1(2)	1
BLR	-0.071230	-1.951332	-5.755215	-1.951687			1(1)	1

Source: Authors' Computation

Unit Root Test

Stationarity tests were performed using the Augmented Dickey Fuller (ADF) statistics. AGY attained stationarity at levels, i.e. 1(0). However, FDI and BLR attained stationarity after first difference, i.e. 1(1), whereas MSS and GNS became stationary after second difference 1(2).

Cointegration Test

To ascertain the number of cointegrating equations, the variables were examined using Jesulius and Johansen cointegration test. The trace statistics indicates two cointegrating equations at 5

percent level of significance and one cointegrating equation at one percent level of significance. The max-eigenvalue test confirms one cointegrating equations at both 5 percent and one percent level of significance. Therefore the null hypothesis of the absence of cointegrating relations among the variables is rejected at both 5 percent and 1 percent level of significance. The results confirm that both trace and max-eigenvalue tests produced three cointegrating equations at 5 percent and 1 percent levels. The existence of cointegration infers the presence of long run equilibrium relationship between the variables.

The estimates of the normalized cointegrating vectors are reported in panel B of table 2. The relative t-statistics are shown in the brackets below each of the coefficients which indicate the existence of equilibrium relationship among the cointegrating variables.

Table 2: Johansen Maximum Likelihood Cointegration Test Results

Date: 02/27/17 Time: 15:11
Sample(adjusted): 1983 2014
Included observations: 32 after adjusting endpoints
Trend assumption: No deterministic trend
Series: AGY FDI MSS BLR GNS
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.856903	105.1745	59.46	66.52
At most 1 *	0.477203	42.95914	39.89	45.58
At most 2	0.420381	22.20513	24.31	29.75
At most 3	0.121792	4.752816	12.53	16.31
At most 4	0.018481	0.596916	3.84	6.51

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 2 cointegrating equation(s) at the 5% level
Trace test indicates 1 cointegrating equation(s) at the 1% level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.856903	62.21535	30.04	35.17
At most 1	0.477203	20.75401	23.80	28.82
At most 2	0.420381	17.45231	17.89	22.99
At most 3	0.121792	4.155900	11.44	15.69
At most 4	0.018481	0.596916	3.84	6.51

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 1 cointegrating equation(s) at both 5% and 1% levels

Error Correction Mechanism Estimates of AGY

The interpretation of the results of the overparameterized ECM usually defies theoretical prescription. The overparameterized ECM was pruned down to obtain parsimonious dynamic ECM. The results of parsimonious error correction model are shown in table 3 below.

Table 3: Parsimonious Vector Error Correction Model of AGY

Dependent Variable: D(AGY)
Method: Least Squares
Date: 02/08/17 Time: 10:12
Sample(adjusted): 1984 2015
Included observations: 32 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	826.4394	1721.025	0.480202	0.6356
D(AGY(-1))	0.345197	0.145901	2.365972	0.0268
D(FDI(-2))	233.6297	445.2522	0.524713	0.6048
D(MSS)	25.08104	3.996682	6.275465	0.0000
D(MSS(-1))	-19.03024	3.388171	-5.616670	0.0000
D(CNS)	-19.35363	3.743203	-5.170339	0.0000
D(GNS(-2))	7.327379	6.173452	1.186918	0.2474
D(BLR(-1))	-201.2757	294.2905	-0.683936	0.5008
ECM(-1)	-0.216663	0.098102	-2.208539	0.0374

R-squared	0.736384	Mean dependent var	492.6202
Adjusted R-squared	0.644691	S.D. dependent var	11944.04
S.E. of regression	7119.583	Akaike info criterion	20.81134
Sum squared resid	1.17E+09	Schwarz criterion	21.22358
Log likelihood	-323.9815	F-statistic	8.030998
Durbin-Watson stat	1.958887	Prob(F-statistic)	0.000039

Source: Authors' Computation

The coefficient of error correction mechanism ECM(-1) is correctly signed with a negative coefficient of approximately 22 percent. This infers that the error correction term lagged one, i.e. ECM(-1) is significant at 5 percent level. The implication is that actual output growth in AGY and long run value of output growth in AGY are corrected by a factor of 0.216663 every year. In addition, it implies that about 22 percent of previous period disequilibrium from long run equilibrium is corrected for within a year, and denotes a feedback of about 22 percent of previous disequilibrium value of AGY output growth

The coefficient of determination (adjusted R-square) measuring the goodness of fit of the estimated model is approximately 64 percent. This conjectures that the utility of the model is moderately high and behaves well and significantly fit in predicting the behaviour of AGY when related with FDI considering other controlled variables used in this study. Nevertheless, there is no evidence to suggest the presence of serial correlation since the Durbin-Watson statistic is 1.98 and lies within the inclusion region. F-Statistic of 8.03 and Prob(F-Statistic) of 0.000039 were estimated in the model. The results confirm that all the explanatory variables including FDI,

MSS, GNS, and BLR jointly explained variation in AGY between 1981 and 2015 in Nigeria at 95 percent confidence level.

Furthermore, the results presented in table 3 show that rejuvenating agricultural sector in Nigeria is influenced by changes in the first lag of AGY. From the table, t-statistic (tc) is 2.365972 and greater than $t_{0.05,n-k-1=2}$.042 when corrected for the degree of freedom. The second lag of FDI, though correctly signed is insignificant in reinvigorating agricultural sector in Nigeria. However, MSS has conflicting results. While money supply in the contemporaneous year is correctly signed and significant with a calculated t-statistic of 6.275465 and greater than tabulated t-value of 2.042, the first lag is incorrectly signed and negatively significant. The elasticity of second lag of GNS is correctly signed but insignificant. According to apriori expectation, bank lending rate (BLR) in the first lag has a negative coefficient but not significant.

DISCUSSION OF THE RESULTS OF VECM

The first lag of agricultural output which is significant infers that transforming agricultural sector for growth depends on past performance of the sector (output). This entails that the altruism character of domestic agriculturists is the catalyst that is required, among others, for the transformation of the sector. In addition, past government policy on agricultural financing and export can significantly promote growth in the sector. The FDI outcome evidently indicates that the variable is not a key factor in rejuvenating the Nigerian agricultural sector. The result of money supply, a proxy for the liquidity of the economic system, reflects policies necessary to further deepen the liquidity of the economic system. The results of gross national savings is a reflection of poor saving habit, which to some extent may be attributed to low disposable income. This adversely affects the volume of money in the financial system and hence exerts pressure on lending rate thus discouraging long term borrowing for long term investment. The upshot of GNS is reflecting on the result of the D(BLR(-1)) which indicates that the variable is not a significant factor in promoting agricultural activities when linked with foreign investors in the sector.

CONCLUSION AND RECOMMENDATIONS

In this study we examined the role of foreign direct investment in rejuvenating the Nigerian ailing agricultural sector and adopted econometric technique for analysis. The study was conducted by modeling agricultural output and testing its response to the activities of foreign investors in the sector. We used data obtained from Central Bank of Nigeria covering between 1981 and 2015. In empirical analysis, the Augmented Dickey Fuller unit root test for stationarity and order of integration of the series was conducted. The non-stationary series attained stationarity after first and second differencing respectively, while AGY was stationary at a level. Johansen maximum likelihood cointegration specification indicates the existence of long run equilibrium relationship between agricultural output, FDI flow to agricultural sector and other selected determinants.

Arising from the above analysis, it would be necessary for the relevant authority to improve the foreign direct investment and agricultural development policies. Relevant authorities need to re-appraise policies aimed at promoting in-bound FDI to the sectors that have the capacity of

boosting employment and alleviating poverty, such as agriculture which employs a preponderance of the citizenry. Noting that investment in agricultural programmes involves long term gestation period, it is therefore, necessary for the monetary authorities to re-focus on the inter-play of lending rates and the expected rate of return on investment in the sector to domestic investments for the revitalization of the sector.

Rather than depend on foreign direct investment to rejuvenate agricultural sector, there is a need for the relevant government agencies to lay a deep-seated foundation for a national self recovery based on strong principles, competition and efficiency at all levels and sectors of the economy. The monetary authority needs to continually embark on some measure of reforms so that a significant proportion of money supply could be directed to agricultural sector through concessionary rates and other financing schemes.

Since the pursuit of monetary stability is one of the cardinal requirements for long term macro-economic sustainability and sectoral growth, it becomes imperative for the central bank of Nigeria to lay a solid framework to harmonize the discordant effect of money supply in both the long run and the short run to reduce the contentious dissonance in money supply in the short run (money supply lag once) and money supply in the contemporaneous period in order to foster robust productive sector, particularly the agricultural sub-sector. In addition, the low level of income impedes domestic savings and exacerbates high lending rates. Therefore, it is suggested that the Revenue Mobilization, Allocation and Fiscal Commission (RMAFC) need to prudently embark on upwards income reviews to strengthen domestic savings, while the monetary authorities should devise mechanisms to curb probable inflationary pressure.

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