EFFECTS OF FOREIGN DIRECT INVESTMENT ON AGRICULTURAL PRODUCTION IN NIGERIA: 1985 TO 2018.

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Abstract
The study determines the effect of foreign direct investment inflow into the agricultural sector and the productivity of the sector in Nigeria from 1985 to 2018. It employed the Ordinary Least Squares Technique, Co-integration Test and Error Correction Mechanism which minimizes the possibility of estimating spurious relations while at the same time, retaining long run information. Amongst other findings, the research reveals that foreign direct investment has significant positive impact on agricultural production. The findings also revealed that corruption perception index and exchange rate have negative impact on agricultural production in Nigeria. The study thus recommends, among other things, an enactment and reformation of extant laws and policies that could boost the ease of doing business in Nigeria. This could be done by enforcing investment attracting mechanisms like tax holidays and tax waivers in order to attract more investment in the agricultural sector.

Keywords: Foreign, Agriculture, investment, production, investment inflow.

Introduction
Agricultural sector is an important area in which Foreign Direct Investment (FDI) has proven effective in tackling the fundamental issues confronting Africa. This is as Foreign Direct Investment (FDI) has brought increase in agricultural productivity and growth and this is critical for reducing poverty enhancing sustainability and food sufficiency in the developing world (Msuya, 2007). Prior to FDI lending by commercial banks to agriculture has fallen across developing nations with sub-Sahara African countries recording less than 10% of the total credit. Along this line, sectoralcredit allocation in Nigeria shows that 3.0% of the total volume of credit was allocated to agricultural sector in 2014 and 2015 (Food and Agricultural Organization and Central Bank of Nigeria (2016). To compound the problem of credit to agricultural sector, the issue of collateral and moratorium period attached to agricultural borrowing as well as the volume of capital required to boost the

agricultural sector makes borrowing from microfinance and other specialized financial institutions unsuitable either (Akpan, Udoh&Umoren,2017).

Worse still, the development assistance directed to agricultural sector in developing countries like Nigeria sometimes does not meet the critical need of beneficiaries. This assistance often tied to project of interest of the donor rather than that of the recipient. For instance the Maputo declaration on Agriculture food Security and the 10 percent national budget allocation to agricultural and rural developments implementable within five years was an illusion to many African countries including Nigeria (FAO, 2016).Following these shortfalls in funding of agricultural sector in developing society such as Nigeria, the need for alternative sources of funding with less stringent condition became overwhelmingly necessary. Hence Nigeria resorted to FDI to boost her agricultural sector. Consequently Nigeria has absorbed new technologies made use of their low-cost labor and her agricultural products have become largely present in the international market (Tvaronavičienė, Grybaitė and Korsakienė, 2008). Indeed, FDI is a globalization strategy that enables investing firms to retain world market share by rearranging their production lines both at home and abroad.

It constitutes one of the fundamental exogenous sources of capital available to several developing economies especially in the Sub-Saharan Africa (Dabour, 2000). It represents a viable channel through which issues like increasing poverty incidence; low capital accumulation, low savings and relatively weak capital and money markets are resolved in developing and sub-saharam Africa countries (Iddrisu, Immurana & Halidu, 2015). It contributes immensely, to financing of agricultural projects and dissemination of technologies among farmers in developing economies like Nigeria (Msuya, 2007). In Nigeria therefore, there has been a tremendous rise in foreign investment inflow over the years. Between 1980 and 1990, FDI inflows in Nigeria averaged over $740 million, over $2 billion between 1991 and 2000, over $ 7 billion between 2001 and 2014 and over 8 billion between 2017 and 2018 (CBN Statistical Bulletin, 2018). This substantial increase notwithstanding, there seem to be varying opinions on the effect of such increases on agricultural production in Nigeria with some analysts claiming that such increases have not yielded expected effects. And so, this paper investigates the effects of foreign direct investment in boosting Nigeria's agricultural sector.

Conceptual Analysis

For the purpose of this study FDI in this context points at oversees investments by private multinational corporations. Similarly, agricultural production has to do with the total annual national output or monetary value of agricultural sector in Nigeria.

Foreign Direct Investment includes external resources that embrace knowledge and capital in technology, managerial and advertising. All of these have a significant effect on the productive capacity of the host nation, and the achievement of public measures to stimulate the productive base of the economy mainly depends on its ability to regulate appropriate amounts of FDI comprising managerial, capital, and technological resources to boost current manufacturing capacity (Omankhanlen, 2011).

Lipsey and Chrystal (2004) describe FDI as a non-resident investment in the form of an acquisition or capital investment in a national branch, plant or subsidiary in which the investor has voting control. The International Monetary Fund (IMF, 1993, section 359) describes FDI as an investment reflecting the goal of acquiring a resident's lasting interest in another economy... lasting interest means the presence of a long-term connection between the immediate investor and the (foreign) undertaking and a significant degree of impact on the leadership of the undertaking by the investor.

Foreign Direct Investment simply implies transfer of resources in the form of capital and technology to another country. Examples of this include management and advertising. These have been seen to significantly affect the productive capacity of the host nation and the achievement of measures to stimulate the productive base of the economy, therefore, depends on its ability to appropriately regulate the amount of FDI comprising managerial, capital and technological resources that boost current manufacturing capacity (Omankhanlen, 2011). Baraja (2010) defined agriculture as the science and practice of producing plants, other crops and animals for food, other human needs for economic gain David and Fuller (2014) contend that agriculture is the most comprehensive word used to denote the many ways in which crops, plants and domestic animals sustain the global human population by providing food and other products. Agricultural output on the other hand deals with quantifying the output of the sector. According to Olabanji, Adebisi, Ese and Oduntan (2017) agricultural output is the value of agricultural products which, free of intra branch consumption are produced during the accounting period and before processing are available for export and consumption.

Statement of the Problem

In spite of the concentration of government on oil revenue, the agricultural sector still contributed to the economy in terms of gross domestic product, foreign earnings and employment creation. Yusuff, Afoloyan and Adamu(2015) aver that agriculture accounts for about 40 percent of GDP and provides employment for about 60 percent of Nigeria’s over 170 million people. With this huge contribution, one would expect that the sector would attract greater attention from the government, but this has not been the case

owing to the total reliance of the economy on crude oil (Akpan et al, 2017). Agricultural sector continues to witness drop in productivity of major farm produce which has resulted in the importation of consumable products that could be produced in the country. Also agricultural sector has been experiencing under funding in the recent years which is due to fall in allocation of funds to the sector in the budget. Financial institutions have also turned away from providing credits to agricultural sector as they prefer lending to industrial and oil companies who could give them more returns, a situation which has made agricultural sector to remain in subsistence nature and rely on crude equipment (Yusuff et al, 2015). Though, the Nigerian economy has benefited from foreign direct investment, however, the recipient sectors have been the communication, banking, education, and industrial sectors with manufacturing sector being the major recipient.

Considering the unstable nature of oil price which has resulted in dwindling oil revenue successive governments have made diversification of the economy into agricultural sector their leading agenda (Udoh&Akpan, 2007; Aya&Akpan, 2009 &Akpan et al, 2017). Over the past 20 years, statistics on Nigeria have shown that, value-added per capita in agriculture in the country was less than one percent per annum. The Federal Ministry of Agriculture and Rural Development in 2008, revealed that, food (crop) production growth rate was far below the population growth, resulting in rising food imports and declining levels of national food self-sufficiency. Indeed, the dominance of small holder farmers with inadequate resources to practice large scale mechanized agriculture for the past twenty years especially in developing countries like Nigeria has resulted in low productivity and dwindling agricultural production (Iddrisu et al 2015). However, the poor fundamental infrastructure such as power supply and transportation further complicate issues in the agricultural sector. And questions regarding the effects of foreign direct investment inflow into the ageicultural sector and the relationshipagricultural production and trade openness have remained unattained to especially in the work of Akpan et al (2017), Idrissu et al (2015) and Anyanwu (2011). Hence this study seek to provide answers to these questions while at the same time accounting for Nigeria's capacity in attracting FDI and its inflow into the agricultural sector from 1985 to 2018.

Purpose of the Study

This study is geared towards determining the impact of foreign direct investment on agricultural production in Nigeria. Specifically, the study will determine if

a. Increasing foreign direct investment in Nigeria has resulted in improved agricultural production.
b. Trade openness and credit to private sector help to boost productivity of the agricultural sector.

Research Questions

- To what extent does increase in foreign direct investment in Nigeria result in improved agricultural production?
- How do trade openness and credit to private sector help to boost productivity of the agricultural sector in Nigeria?
- How do corruption perception index and exchange rate affect agricultural production in Nigeria?

Theoretical Framework

The Cobb-Douglas Production Function

This production function is used to show the relationship between the quantities of two or more inputs employed in the production of specified quantities of an output. These inputs can be physical capital and labour. Hence Cobb Douglas production function can be used to explain the relationship between FDI inform of capital (technology or funds) transfer and output of the agricultural sector. (Ogbuabor&Nwosu, 2017). This function relates input and output in a multiplicative function thus:

$$\mathbf{Q = f(K, L) = AK^aL^b}$$

Where A, a, and b are all positive constants and Q is the output level. Q can be assumed to be the monetary value of all goods produced annually in the economy, L = labour input which is the total number of person-hours worked in a year, K = capital input or the monetary worth of all machinery, equipment, and buildings; A is total factor productivity, a and b are the output elasticities of labour and capital, respectively. Koutsoyiannis (2002) opined that these constants are determined by available technology. The predictions of this theory indicate that if agricultural output were to be represented by Q, given that inflow of foreign direct investment yields more capital to thehome country, K can be taken to mean foreign direct investment while L which is the total labour force can represent the absorptive capacity of the recipient country.

The Stochastic Frontier Production Function

The stochastic frontier production function (SFPF) was developed by Aigner, Lovell and Schmidt (1977) and Meeusen and Van den Broeck (1977) and utilized by Battese and Coelli (1993)to estimate production and goal attainment functions of a firm. Production function shows the technical relationship between given input and output of a firm (Battese and Coelli 1993) and (Hossain, Alam and Uddin, 2015). Based on this theory, agricultural production is aggregated for all the farmers to obtain the aggregate farmer therefore defines the frontier. Deviation from this frontier could emanate from mismeasured production factors. Estimation of the

frontier presupposes that the boundary of the production function is defined by optimal farmers. If a firm moves away from the boundary, this is accommodated since the estimation procedures are stochastic. This theory can therefore, be employed to depict the relationship between the input inform of capital (funds and technology) and labor transferred as FDI and agricultural output.

Theory of Productive Efficiency

The theory of productive Efficiency was proposed by Farrel (1957). He classified the theory into Allocative Efficiency and Technical Efficiency. Technical Efficiency implies the ability of a firm to produce a given level of output with minimum quantity of input under a given technology. Allocative efficiency is a measure of the degree of success in achieving the best combination of inputs in producing a specific level of output with consideration given to the relative prices of these inputs (Arene, 2003). Based on this theory, therefore, the agricultural farmer is assumed to allocate and utilize inputs obtained through FDI in an efficient way to generate an optimal level of production. According to Umoh, (2006), maximum efficiency of a firm is attained when it is impossible to reshuffle a given resource combination without decreasing total output.

The Link between Foreign Direct Investment and Agricultural Production in Nigeria

There is a significant connection between FDI and agricultural production in Nigeria. EL-Wassal (2002) pointed out that there is connection between FDI and growth in agricultural production. He categorized the connection into the positive view, the negative view and the dependent impact view. According to him, the positive impact view which stems from the neoclassical economic growth theory that classifies the positive impact into direct and indirect impacts. The direct impact considers the impacting of FDI on growth from augmentation of domestic capital based on the proposition of the philosophy that it is capital that drives growth. this implies that given the increased capital inflow through FDI more capital will be available for agricultural production. The indirect impact view on the other hand results from knowledge and technology that are included as factors of production, the transfer of which in form of FDI will lead to improvement in techniques of agricultural production (Romar, 1994), (Kumar and Pradham, 2002) and (Moran, Grabam and Blostrom, 2005). The negative impact view implie that FDI is connected to agricultural production by widening agricultural income inequality hence negatively impacting agricultural output in the recipient economies (Bomschier, Chase-Dunn and Rubinson, 1978) and (Nolan, 1983).

As for the dependent impact view, FDI is connected to agricultural production through its absorptive ability of the host country's characteristics. These characteristics include rate of domestic investment, well developed financial market, export orientation and trade openness (Blomstrom, Lipsey and Zejan, 1994), Lautier and Moreaub (2012), (Alfaro and Charlton 2007), (Balasubramaryan, Salisu and Spasford, 1996).

Effect of Foreign Direct Investment on Agricultural Production in Nigeria

On the impact of FDI on agricultural production, there have been divergent views and findings by researchers with these findings revolving around the positive view, negative view and the dependent impact view. For example, Oloyede (2014) studied the impact of FDI on the development of the agricultural sector in Nigeria using time series data covering the period 1981 and 2012 and employing the Ordinary Least Square (OLS) estimation technique. The author finds FDI to positively impact agriculture. The author also finds instability of the political environment to inversely affect the agricultural sector. Adeyeye (2016) looked at the impact of foreign direct investment on the growth of Nigeria's agricultural sector. The research covered the 1981-2015 periods. Multiple regression method was used in the research. The findings showed a favorable and substantial impact of FDI on agricultural production. Thus, the research found that foreign direct investment has a beneficial impact on Nigeria's agricultural sector growth. In 2016, Fauzel, Seetanah and Sannasee also conducted a survey to tackle the significant issue of whether foreign direct investment in the agricultural sector enhances the sector's productivity in Mauritius using information from the 1980-2010 time series. Using a dynamic vector error correction model, catering for dynamic endogeneity and causality, the findings indicate that FDI in the agricultural sector has actually contributed to overall productivity factor as well as long-term labor productivity while inflation and exchange rate are negative contributors to the productivity of the agricultural sector. Analyzing the outcomes of the short run, the research discovered that FDI continues to affect productivity in the agricultural sector, but the effect is very low.

On the negative view, Ogbanje, Okwu and Saror (2010) used Pearson Product Moment Correlation analysis to determine the relationship between agricultural FDI and agricultural GDP and found a strong negative relationship. Olayide (2014) examined the impact of foreign direct investment on agricultural sector in Nigeria by employing secondary time series data which spanned from 1981 to 2012 using multiple regression. It was found in the study that FDI impacted negatively on agriculture not only in the short-run but also in the long-run. Abu et al., (2011) explored the relationship between foreign direct investment and agricultural production in Nigeria. It was revealed that foreign private investment had negative but insignificant effect

on agricultural output while government expenditure had positive effect on agricultural output.

On the dependent impact view, Yusuff et al (2015), researched on analysis of foreign direct investment on agricultural sector and its contribution to gross domestic product in Nigeria in which they investigated the impact of agricultural foreign direct investment on agricultural sector productivity in Nigeria and used descriptive statistics and simple linear regression with the result showing that the inflow of Foreign direct investment to agricultural sector did not follow a regular pattern, but that the sector's contribution to gross domestic product was in direct relationship with the inflows of Foreign Direct Investment. Daniel and Maiwada (2015) analyzed the nature and volume of Chinese trade and investment in Nigeria's agricultural sector and its impact on the Nigerian economy. The study revealed that the agricultural sector which hitherto dominated the economy especially as a source of revenue soon gave way to crude oil and it was revealed that Chinese trade and investment in Nigeria's agriculture is very low compared to other sectors and has not focused much in the development of the sector in Nigeria owing to its dependence on the characteristics of the Nigerian economy.

Agricultural Production and Trade Openness

Djokoto (2013) looked at how trade openness impacts agricultural performance in Ghana by using FDI as a proxy for openness and data covering the period 1995 and 2009. The study revealed that trade openness is a major determining factor of agricultural production in Ghana as it positively affects the performance of the agricultural sector. Sakyi (2011) found a long run relationship among agricultural growth, openness of trade and foreign aid in Nigeria by using autoregressive distributed lag (ARDL) bounds test approach and data covering the period 1984 and 2007. Insah (2013) found a positive relationship between trade openness and agricultural sector growth in Ghana. Using the same data coverage of between 1980 and 2010, Antwi, Mills and Zhao (2013) found a similar result on Ghana by establishing that trade openness has a positive relationship with agricultural sector growth in Ghana.

Saqib, Masnoon and Rafique (2013) reviewed the effect of trade openness on Pakistan's agricultural sector growth from 1981 to 2010. They used six variables where agricultural sector contribution to GDP is specified as dependent variable while independent variables were trade openness, Total Debt Service, Gross Domestic Savings, inflation. The results suggested an important adverse connection between trade openness and agricultural sector growth. There was also an adverse connection between debt, inflation and trade and the performance of the sector. Koojaroenprasit (2012) used

secondary data for the period 1980–2009 to explore the effect of openness to trade on South Korea's agricultural sector development. The research used multiple regression analysis. This research discovered that the effect of openness on South Korean agricultural sector growth is significant and positive. Moreover, the research showed that human capital, jobs and exports also have a favorable and substantial effect, while national investment has no significant effect on agricultural sector growth in South Korea. The empirical relationship between openness to trade and agricultural sector growth in Nigeria between 1970 and 2008 was also explored by Umoh, Jacob and Chukwu (2012). They used concurrent and single equation schemes to examine this connection. Their findings indicate that from agricultural growth to openness and from openness to agricultural growth, there is a beneficial cause.

Methodology and Instrumentation

Data for this study will be obtained through secondary sources and analyzed to answer the research questions. A multivariate ordinary least square model will be adopted. in their study on the impact of FDI on agricultural productivity, Fauzel et al (2016) specified a model where FDI, inflation rate exchange rate and interest rate served as the explanatory variables. Given the nature of the present study, the model used by Fauzel et al (2016) will be adopted with little modification. Given that the present study intends to account for Nigeria's characteristics which form the absorptive capacity of the country and given the objectives of this study, the model used by Fauzel et al (2016) will be modified through the addition of the variables like trade openness and absorptive capacity variables such as institution quality and financial institutions capacity, while excluding some variables from their model. Following from the above modifications therefore, the model for this study is specified as follows:

$$y_i = A_i . f(x_i, \Psi) \quad - - - - - - - - - - - - 3.1$$

Where y_i is the observed output by the producer i; x_i is a vector of K inputs used by the farmer i, $f(x_i, \Psi)$ is the production frontier and Ψ is a vector of technology parameters to be estimated. A_i represents technical efficiency defined as ratio of observed input to maximum feasible output. Let us assume that Ai is a stochastic variable with a normal distribution function that is common to all rice farmers, then, we can write $A_i = \exp\{-u_i\}$ where $u_i \geq 0$. Suppose we add a stochastic component; $\exp\{v_i\}$, that captures random shocks affecting the production of rice such that each rice farmer faces different shocks, the production function becomes:

$$y_i = f(x_i, \Psi).\exp\{-u_i\}.\exp\{v_i\} \quad - \quad - \quad - \quad - \quad - \quad - \quad 3.2$$

Now if we assume a log-linear Cobb-Douglas production, then (3.2) would become a translog stochastic production frontier of the form:

$$\ln y_i = \Psi_0 + \sum_k \Psi_k \ln x_{ki} + v_i - u_i \quad - \quad - \quad - \quad - \quad - \quad - \quad 3.3$$

Where Ψ_k *is a 1* x *k vector of unknown parameter to be estimated*

The systematic error component, v_i, is assumed to be independently and identically distributed *(i.i.d)* random error having normal distribution with mean zero and variance δ_v^2, that is, $v_i \sim N(0, \sigma_v^2)$. u_i are non-negative random variables associated with the technical inefficiency of production. Given that FDI also involves technology transfer, Ψ_k in the model will capture this technology transfer through FDI while x_i which is a vector of inputs will capture all other explanatory variables in the model.

AGDP = F(FDI, DI, TRO, CPI, CPS, EXR) - - - - - - 3.4

The mathematical form of the model is specified as:

$AGDP = \alpha + \beta_1 FDI_t + \beta_2 DI_t + \beta_3 TRO_t + \beta_4 CPI_t + \beta_5 \ 9 \ + \beta_6 EXR_t$ -` - - 3.5

Given that there are other variables that affect agricultural production, but for simplicity, these other variables were not explicitly included in the model, the error term will be introduced in the econometric form of the model; the log form of some variables will also be introduced into the model in order to reduce the extreme values of those variables and avoid the problem of explosive modelling. The log-linear econometric form of the model is therefore as specified below:

$LogAGDP = \alpha + \beta_1 LogFDI_t + \beta_2 LogDI_t + \beta_3 TRO_t + \beta_4 CPI_t + \beta_5 LogCPS_t + \beta_6 EXR_t + \mu_t$ - 3.6

Where:

LogAGDP = Log of agricultural sector contribution to GDP (proxy for agricultural production)
LogFDI = Log of Foreign Direct Investment.
LogDI = Log of domestic investment
TRO = Trade Openness (calculated as the ratio of export and import to GDP)
CPI = Corruption perception index (proxy for institutional quality)
CPS = Credit to private sector (proxy for financial institutions capacity)
EXR = Exchange rate
α = Intercept.

β_1, β_2, β_3,β_4,$\beta_5$and β_6 are the coefficients.
μ = error term (representing other variables that affect agricultural production but are not explicitly specified in the model)
t = Time factor

The choice of the Multivariate Ordinary Least Square is hinged on the fact that among other estimation techniques for linear models, the Ordinary Least Squares (OLS) is the best because if produces parameters that are unbiased, consistent and efficient (Gujarati, 2007). The multiple regression analysis will also be carried out in view of the multiple nature of the models. It is expected that all the variables will positively affect agricultural production except for corruption perception index and exchange rate which are expected to have negative effect on agricultural production.

The "t statistics" will be employed to answer research questions while the "R^2" and Adjusted R^2 statistics will be employed as the coefficient for determination to measure the goodness of fit of the regression line to the observed sample values of the variables while the "F statistics" will be used to test the overall significance and predictive power of the model. The unit root test,conitegration test and the error correction modeling techniques will be adopted. The secondary data will be sourced from the publications of the central bank of Nigeria (CBN) statistical Bulletin (2018) and the World Bank's World development Indicators (WDI, 2018).

Presentation and Analysis of Results

Unit Root Test

The analytical techniques discussed in the previous chapter were applied to the models of the study and the results are presented in this section. Since empirical analysis based on time series data would be biased if the underlying data are non stationary, the unit root test is therefore necessary to check for the stationarity of the variables. The test used for observing the stationarity of the time series data used for analysis in this study is the Phillips-Perron unit root test. The results are summarized in table 1 below:

Table 1 Summary of Phillips-Perron Unit Root Test Result

Variables	ADF Statistics	Order of Integration	Remarks
D(AGDP)	-6.120641	1 (1)	Stationary at first difference
D(FDI)	-4.454510	1 (1)	Stationary at first difference
D(DI)	-9.910565	1 (1)	Stationary at first difference
D(TRO)	-6.058691	1 (1)	Stationary at first difference
D(CPI)	-4.055807	1 (1)	Stationary at first difference
D(CPS)	-9.975666	1 (1)	Stationary at first difference
D(EXR)	-5.018379	1 (1)	Stationary at first difference
ECM	-5.259587	1 (0)	Stationary in level

Source: Researcher's compilation using Eview 9 (2019).

As seen in table 1, all the variables were stationary at first difference. The ECM was stationary in level. This provides a strong criterion for the cointegration analysis.

Cointegration Test

Since short run equilibrium has been revealed to exist among the series, there is the need to investigate the existence or otherwise of long run equilibrium among these series. This test will be done using the Johansen and JuseliusCointegraion Test.

Hypothesis:

H_0: The series do not cointegrate

H_1: The series cointegrate

Decision Rule

Reject the null hypothesis if the trace statistic > the 5% critical value or if the probability value < 0.05. The cointegration test tables are presented below:

Table 2: Cointegration test result

Hypothesized No. of CE(s)	Eigen value	Trace statistic	0.05 critical value	Prob**
None *	0.574838	75.03576	69.81889	0.0180
At most 1*	0.478797	45.95606	37.85613	0.0446
At most 2	0.365299	23.80110	29.79707	0.2090
At most 3	0.210923	8.344677	15.49471	0.4293
At most 4	0.008505	0.290390	3.841466	0.5900

Source: Author's computation using Eviews 9(2019)

From table 2 above, there were two cointegrating equations in the series. Hence we reject their respective null hypotheses while concluding that the series has long run equilibrium relationship. This therefore means that in the long run (that is, the period when all factors are variable) the variables directly or indirectly influence the behavior of each other.

Since the short run and long run relationships cannot individually explain the exact behavior and nature of relationships between variables, it is necessary to combine both the short run and long run components in order to ascertain the speed of adjustment and the level of disequilibrium/discrepancies in the previous period that were actually corrected in the present period. This therefore necessitates the error correction n 11 Again, to determine the maximum lag length so as to enable a parsimonious regression result, the optimal lag selection criteria was adopted and lag 1 was adopted as the maximum lag for the three models using the Akaike Information criteria as evidenced in the table below:

Table 3: Optimal Lag Length Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-479.2687	NA	4.28e+16	52.60404	52.82851	52.68059
1	-712.9348	257.222*	2.17e+13*	44.87852*	46.22530*	45.33781
2	-890.1344	21.34875	4.13e+13	45.41967	47.88878	46.26171

Source: Author's compilation (2019) **Where * indicates lag order selected by the criterion**

Summary of The Regression Result: Dependent Variable- D(AGDP)
ECM (SHORT RUN) MODEL

Variables	Coefficient	Std. Error	t-statistic	Prob.
C	0.022058	0.010594	2.082179	0.0463
D(FDI)	0.069369	0.015367	2.260425	0.0176
D(DI)	0.050519	0.000323	3.609099	0.0184
D(TRO)	0.051609	0.545410	2.102745	0.0443
D(CPI)	-0.013332	0.032256	-1.513478	0.4015
D(CPS)	0.030069	0.047439	1.048730	0.2109
D(EXR)	-0.010331	0.210492	1.082747	0.3201
ECM(-1)	-0.582376	0.152848	-3.810175	0.0007
R^2= 0.527281	F stat= 46.69436	R^2Adj= 0.445777	F proby=0.00037	

Source: Researcher's compilation using Eview 9(2019)

Table 5: Summary of the Regression Result: Dependent Variable- AGDP LONG RUN MODEL

Variables	Coefficient	Std. Error	t-statistic	Prob.
C	6.855847	0.453884	15.10486	0.0000
FDI	0.081253	0.007190	4.301127	0.0009
DI	0.060280	0.000342	3.816782	0.0203
TRO	0.067111	0.023610	2.080638	0.0362
CPI	-0.031361	0.019980	-1.071127	0.3044
CPS	0.503830	0.937387	2.347482	0.0103
EXR	-0.204749	0.983163	-1.537391	0.4592
R^2= 0.743972	F stat= 130.5745	R^2Adj= 0.736743	F proby=0.00000	

Source: Researcher's compilation using Eview 9(2019)

From tables 4 and 5 above, the estimated coefficients of 0.069369 in the short run and 0.081253 in the long run for foreign direct investment shows that a percentage increase in foreign direct investment will subsequently increase agricultural production in Nigeria by about 6% and 8% in the short and long run periods respectively. Similarly, the coefficients of 0.051609 in the short run and 0.067111 in the long run for trade openness show a positive relationship between trade openness and agricultural production in Nigeria. This indicates that a percentage increase in trade openness will increase agricultural production by about 5% and 6% in the short and long run periods respectively. The coefficient of -0.013332 in the short run and -0.031361 in the long run for corruption perception index shows that a percentage increase in corruption perception index will decrease agricultural production by about 1% and 3% in the short and long run periods respectively. The coefficient of 0.030069 and 0.053830 in the short and long run periods respectively for credit to private sector shows that a percentage increase in credit to private sector will increase agricultural production by about 3% and 5% in the short and long run periods respectively. Again, the coefficient of -0.010331 in the short run and -0.204749 for exchange rate shows that a percentage increase in exchange rate will bring about a 1% and 2% decrease in agricultural production in the short and long run periods respectively. Finally, the negative coefficient for the ECM shows that in the previous period, the long run component of the ECM model (i.e., ε_{t-1}) had a value that was > 0 which means that the value of the regressor and in the previous period was above its equilibrium value, hence, the ECM short run component (i.e., α) needed to take a negative value to restore the value of the regressor and back to equilibrium in the long run. Therefore, from the result, the coefficient value of -0.582376 for the ECM shows that about 58% of the disequilibrium/discrepancies in the previous period (short run) were corrected in the present period (long run). This therefore shows a high speed of adjustment to long run equilibrium.

Discussion of Findings

Since the long run period represents the period when all factors of production and all variables vary, the discussion of findings in this section will be based on the long run regression output. The result indicates that a percentage increase in FDI inflow into the agricultural sector brings about an 8% increase in agricultural production. This implies that as FDI inflow into the agricultural sector increases, agricultural production will also increase. This is expected given that FDI inflow leads to technology transfer. These technologies may come inform of machineries and other mechanized farming equipment and improved seedlings and fertilizer which goes a long way in improving capital formation in the sector. The improved capital formation will consequently lead to an improvement in labour efficiency and effectiveness thereby leading to an increase in output per labour and the general productivity of the sector. This finding is in line with that of Oloyede (2014) and Adeyeye (2016).

The result also shows that a percentage increase in trade openness will increase agricultural production by about 6%. Given that trade openness will increase is the ratio of import and export to the GDP, it goes to determine the extent to which engagement in trade affects the domestic economy. Hence, an increase in trade openness would mean that the domestic economy benefits from international trade. Such benefits increase foreign exchange earnings leading to further appreciation of domestic currency which increases the gains from agriculture thereby leading to an increase in farmers' income with an attendant increase in agricultural production through expansion and acquisition of improved farming implements. These findings were in line with those of Agrawal (2015); Melnyk et al (2014) and Djokoto (2013).

On corruption perception index, the findings showed that increases in corruption perception index which is a sign of deteriorating institutional quality will decrease agricultural production. This result is predicated on the fact that a decline in institutional quality will lead to a decline in the ease of doing business index which will further exacerbate FDI inflow into the economy and agricultural sector in particular leading to further decline in domestic investment and general agricultural production.

The findings further showed that increases in exchange rate will decrease agricultural production in Nigeria. Given that an increased exchange rate means a depreciation of the domestic currency, such depreciation leads to an increase in the cost of importation which invariably affects the importation of agricultural implements leading to a decline in agricultural production. These findings are in line with that of Fauzel et al (2016).

Summary

This study was undertaken to empirically evaluate foreign direct investment and agricultural production in Nigeria from 1985 to 2018. The study was specifically carried out to determine the effect of foreign direct investment inflow into the agricultural sector on the productivity of the sector, the agricultural production-domestic investment nexus, and the relationship between agricultural production and trade openness in Nigeria. In order to achieve these objectives of the study, an econometric model was specified. The data used for the research were from secondary source obtained from Central Bank of Nigeria (CBN) Statistical Bulletin (2018) and World Bank's World Development Index (WDI, 2018).

The findings of the study showed that foreign direct investment, domestic investment, trade openness and credit to private sector (financial institutions capacity) have significant positive effect on agricultural production while corruption perception index (proxy for institutional quality) and exchange rate have insignificant negative impact on agricultural production in Nigeria.

Recommendations

Given the findings of the study, the policy recommendations are given below:

- An enactment and reformation of extant laws and policies that could boost the ease of doing business index for Nigeria. This could be done by reinvigorating investment attracting mechanisms in the less invested sectors of the economy such as the mining and quarrying and the agricultural sector.
- Enhancement of international competitiveness through an improved exportation which will increase the trade openness index and further improve the already existing positive effect of trade openness on the performance of agricultural sector. This will also help to minimize the negative effect of exchange rate vagaries on agricultural production.

Conclusion

In a bid to ascertain whether the research questions of the study were upheld, the following conclusions were drawn from the findings of the study:

- Increasing foreign direct investment helps boost agricultural production in Nigeria.
- Trade openness also helps to boost agricultural production in Nigeria.
- Corruption perception index and exchange rate are inhibitors to the growth of agricultural production in Nigeria.

From the above, it is evident that foreign direct investment is a catalyst to agricultural production in Nigeria.

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