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Foreign Direct Investment, Electricity Power Supply and Economic Growth in Nigeria

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ABSTRACT

This study examined the stimulation of foreign direct investment (FDI) inflows through constant electricity power supply for economic growth in Nigeria, by engaging time series data sourced from the world development indicators (WDI) for the period 1986-2017 and employed the Autoregressive distribution lag econometric approach to co-integration. The gross domestic product growth rate per capita was the proxy for economic growth and the dependent variable, while the independent variables include FDI, labour force participation rate, gross fixed capital formation and electricity power supply. The result from the study showed that, in the long-run, increased FDI inflows, gross fixed capital formation, electricity power supply, have the potency of increasing economic growth by 30%, 20% and 6%, respectively. Therefore, based on the results obtained, the study recommended that there should be constant electricity power supply to keep pace with productivity for efficient economic growth in Nigeria.

Keywords: Economic Growth, Electricity Power, Foreign Direct Investment
JEL Classifications: O47, L94, H54

1. INTRODUCTION

Foreign direct investment (FDI) simply means the flow of capital between different countries of the world. This is referred to as the investment which is engaged towards acquiring lasting interest in organisations that operate outside the home country of the investor's economy. There has been an argument as to the role of FDI in achieving economic growth in various studies in economics and other fields. In theory, FDI involves technology transfers, human capital development and generation of employment, resulting in economic growth in the host economy, as seen in Latin America (*Alva*rado and Ponce, 2017). Various approaches have been engaged to encourage FDI inflows in different regions of the world. Such approaches include regular supply of electricity which will enhance productivity to stimulate economic growth (*Matthe*w et al., 2018). Other studies such as *Sunde* (2017) observed that in Asia, especially in China, the invention and application of the electric power technology promoted economic growth of the

Asian tigers. This implies that, electricity consumption in the Asian regions accelerated the industrial development of China and other Asian countries. This is one of the reasons why FDI inflows have increased substantially in recent years across various countries of the world.

Irrespective of the various studies which have been conducted to examine the relationship between economic growth and FDI, conclusion on the subject matter has not been achieved. Among the studies reviewed, irrespective of the fact that it is understood that FDI increases economic growth, some have argued that institution is not a factor to enhance FDI inflows, others have argued that electricity supply is a major determinant of FDI inflow. Very few studies have investigated the impact of electricity supply on FDI towards attaining economic growth in Nigeria. This study is motivated to fill this gap, add to the frontiers of knowledge and to the extant literature. The study is structured into five sections. Section one is the introduction, while in section two, relevant

literature was reviewed while in section three we discussed the methodology. In section four we presented results obtained in the study while section five was the conclusion.

2. LITERATURE REVIEW

Various studies have been conducted on the role of FDI on economic growth. Alam (2013) examined the comparative relationship between electricity power consumption, FDI and economic growth in India and Pakistan by employing co-integration and error correction methods of analyses in data running from1975-2008. In both countries, electricity consumption and FDI boost economic growth.

Alege and Ogundipe (2014) in their study employed the system generalised method of moments (SGMM) econometric approach to examine the rate at which national framework of Nigeria influences economic growth. The study found out that institutional factors such as political stability and absence of violence affect FDI inflow. Investors need a peaceful and feasible environment. Consequently, where there is absence of peace, investors will find it difficult to establish their businesses there.

Ibrahiem (2015) investigated the effects of renewable electricity consumption and FDI on economic growth on a time series data from 1980-2011 in Egypt by employing Auto Regressive Distributed Lag (ARDL) bound testing approach. The result showed that renewable electricity consumption and FDI have a long run positive effect on economic growth.

Alvarado and Ponce (2017) investigated the effect of FDI on economic growth in 19 Latin American countries, by employing panel data econometrics. The study found out that on the aggregate, the effect of FDI on economic growth is not significant. However, when the levels of development reached by the countries in the region were incorporated, a positive and significant relationship was observed between FDI and economic growth in high-income countries but uneven and non-significant result was obtained in upper-middle-income countries, however, the effect in lower-middle income countries was negative and statistically significant.

Sunde (2017) employed ARDL bound testing approach to co-integration to investigate the long run relationship between economic growth, FDI and exports in South Africa. Also, error correction model was used to examine the short run dynamics, while the VECM Granger causality approach was used to investigate the direction of causality. The result showed that both FDI and exports spur economic growth. The granger causality showed a unidirectional causality between economic growth and FDI, running from FDI to economic growth.

Zhang et al. (2017) examined the effect of electricity consumption on economic growth in China. The study found out that electricity provides the sustainable power for economic and social development because increase in electricity consumption promoted the progress of industrial economy in China.

Long et al. (2018) investigated the causal relationship between electricity consumption, FDI and economic growth in Vietnam during the period 1990-2015, by using Toda Yamamoto approach to causality and autoregressive distributive lag approach. The result showed that electricity consumption and FDI have positive impacts on economic growth in Vietnam, both in the short and long run.

Makiela and Quattara (2018) explored the transmission channels from FDI to growth on a sample of developed and developing countries from 1970-2007. The result showed that FDI affects growth through inputs accumulation and not through total factor productivity. This implies that factors other than FDI may cause increase in productivity in developing countries.

Matthew et al. (2018) examined the nexus between institutions and economic growth by finding out the effect of human capital development, through the usage of electricity power for maximum productivity, in enhancing growth in Nigeria. The study found out that human capital development is insignificantly related to economic growth in Nigeria, while electricity consumption is significantly linked with economic growth. They argued that though institutional framework is good in stimulating FDI, foreign investors would like to invest in a country with constant supply of electricity power since the cost of generating power is high in developing countries The study implies that electricity power supply is statically significant in determining how effective human capital development is, in attaining economic growth in Nigeria.

It should be noted that literature on the electricity consumption-FDI-economic growth nexus is scarce in Nigeria, therefore, this study is set out to contribute to knowledge by filling this gap; thus, policy to turn around the situation towards attaining the desired level of economic growth in Nigeria was recommended in the study.

3. METHODOLOGY

The model specification provides a general overview of the basic variables utilised during the analysis. Therefore, the baseline mode for the model is specified in its implicit form as presented in equation (1)

$$GDPPCGR_t = f(FDI_t, GFCF_t, LABF_t, ELECT_t) \qquad (1)$$

Given the implicit form of the model as specified in equation (1), it can be predicted that the nexus existing among the exogenous and the endogenous variables are in their linear forms as explicitly specified in equation (2), thus:

$$GDPPCGR_t = \beta_0 + \beta_1 FDI_t + \beta_1 FDI_t + \beta_2 GFCF_t \\ + \beta_3 LAB_{it} + \beta_4 ELECT_t + \mu_{it} \qquad (2)$$

From above; GDPPCGR means gross domestic product per capita growth rate, FDI means FDI, GFCF means gross fixed capital formation, LAB means labour force participation rate and ELECT means electricity power. β_0 is the constant term, $\beta_1 \beta_2, \beta_3, \beta_4$ are the coefficients of the explanatory variables, t represent time, while ε represents the error term.

The method employed for the analysis is the Autoregressive Distribution Lag (ARDL) approach to co-integration, which aimed at examining how FDI will be stimulated through constant electricity power supply towards achieving economic growth in Nigeria. Thus, the model which was adopted from the empirical work of Osabuhien, Osabuhien and Urhie (2018) is specified as

$$\Delta GDPGRPC_t = \beta_0 + \sum_{t=1}^{n} \beta_1 \Delta FDI_{t-1} + \sum_{t=0}^{n} \beta_2 \Delta GFCF_{t-1}$$

$$+ \sum_{t=0}^{n} \beta_3 \Delta LABF_{t-1} + \sum_{t=0}^{n} \beta_4 \Delta ELECT_{t=1}$$

$$+ \gamma ECM_{t-1} + \varepsilon_{t-1} \tag{3}$$

Where: Δ is the change in operator and the ECM_{t-1} represents the correction mechanism of the white noise. γ means the speed of adjustment.

The hypothesis is stated thus:s
H_0: $\beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4$ (No long run relationship exist)
H_1: $\beta_0 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4$ (Long run relationship exist)

The *a priori* expectations are: $\beta_1 > 0$, $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$, and $\beta_4 > 0$. That is, FDI, gross fixed capital formation, labour force participation rate and electricity power consumption should be positive, which means that, increase in the rate of the exogenous variables have positive effect on economic growth in Nigeria.

4. RESULTS

This section of the study presents the results obtained from the analysis. The results presented in this study are of two folds: First, the trend analysis which shows the rate at which the selected variables in the study behave over the period of study. The second aspect of the result is the result obtained from ARDL econometric approach.

4.1. Trend Analysis
The trend analysis as presented in Figure 1 shows the movement and fluctuations of the selected variables: gross domestic product growth rate per capita, FDIs, labour force participation rate and gross fixed capital formation.

From Figure 1 which shows the trend of the variables, it was observed that variables did not show a consistent trend from 1986 to 2016. The growth rate of the gross domestic product per capital was between −12% and 10% from 1986 to 2002 but increased to 30% between 2002 and 2004. However, it decreased to 0% in 2005. Similarly, other variables show inconsistencies in their trends from 1986 to 2016 as shown in Figure 1.

4.2. Econometric Results
The first aspect of the econometric results is the presentation of summary analysis in Table 1.

From Table 1, the mean value of the gross domestic product per capita is approximately 0.91 and it ranges from −15.5 (minimum) to 20.4 (maximum), with a standard deviation of 7.32. Similarly,
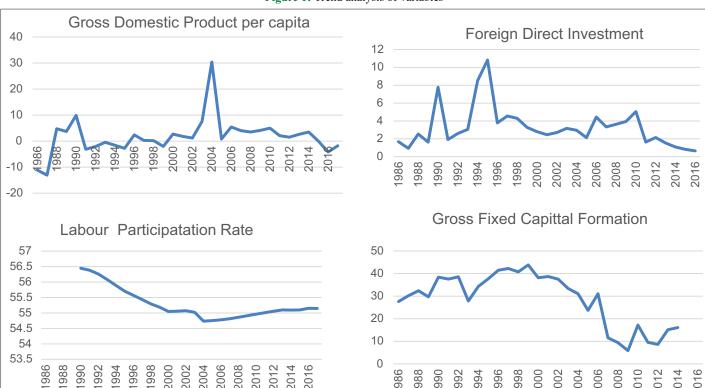
Figure 1: Trend analysis of variables

Source: Authors compilation using data from world development indicators (2017)

FDI has a mean value of 7.6, standard deviation of 3226, with minimum and maximum of 33.19 and 86.28 respectively. Labour force participation rate has a mean value of 40.08, with the standard deviation of 18.88, minimum and maximum values of 2.5464 and 4.8765 respectively, while. Electricity power supply has a mean value of 4277, standard deviation of 94674.0 and minimum and maximum values of 2821 and 5991, respectively.

To ensure that the estimates are not spurious and that the results are BLUE- Best Linear Unbiased Estimators, the unit root test of stationarity was conducted on the selected variables using the ADF and the Philip-Peron (PP) criterion as presented in Table 2.

From the result obtained, it was observed that the variables trend difference. That is, they have different order of integration. Given the above, the result from the Autoregressive distribution lag (ARDL) is presented in Table 3.

From the ARLD result, it shows that FDI, labour force, gross fixed capital formation and electricity power supply are statistically significant. In the short run, FDI inflows increases gross domestic product by 3%, but in the long-run, 30%, at both lag 1 and lag 2. The implication of this is that increased inflow of FDI has the potency of increasing the level of growth in the economy.

Labour force is also statistically significant in explaining the level of economic growth. In the long-run, labour force participation rate increases economic growth by 20%. The implication of this result is that, increased workforce through employment will invariably enhance the level of growth in the economy. In this regard, effort should be made to increase work force in order to enhance productivity in the Nigerian economic growth process. In line with the empirical study of Matthew et al. (2018), which was conducted to examine the effect of electricity supply on economic growth through the development of human capital, the study found that increased supply of electricity power enhances economic growth, this is validated in this study as seen the result obtained from the autoregressive distribution lag which shows that increase in the level of supply of electricity power will enhance economic growth. From the result, 1% increase in the supply of

Table 1: Summary statistics of variables

Variable	Mean	Standard deviation	Minimum	Maximum
Gross domestic product per capita	0.9076	7.3173	−15.4547	20.3565
Foreign direct investment	7.6017	32.259	33.1972	86.2819
Gross fixed capital formation	0.6687	0.08192	0.52934	0.8162
Labour force	40.0847	18.8786	2.5464	4.8765
Electricity power	4277	94674.10000	2821	5991

Source: Authors' Computation, (2018).

Table 2: Unit root test for stationarity

Variable	ADF test statistics	Critical values					PP test statistics	Critical values				
		@ 1%	@ 5%	@ 10%	Integration order	Remark		@ 1%	@ 5%	@ 10%	Integration order	Remark
Gross domestic product per capita	−4.53	−3.62	−3.78	−2.458	1(0) Level	Stationary	−2.15	−3.26	−2.45	−2.11	1 (0) Level	Stationary
Foreign direct investment	−3.372	−3.67	−2.45		1(0) Level	Stationary	−3.86	−3.26	−2.45	−2.11	1 (0) Level	Stationary
Gross fixed capital formation	−6.50	−4.32	−3.57	−3.23	1(1) at 1st difference	Stationary	−9.08	−4.43	−3.44	−3.04	1 (1) at 1st difference	Stationary
Labour force	−5.44	−4.22 −3.07	−3.48	−3.07	1(1) at 1st difference	Stationary	−6.05	−4.43	−3.44	−3.04	1 (1) at 1st difference	Stationary
Electricity power supply	−6.96	−4.23	−3.57	−3.12	1(1) at 1st difference	Stationary	−11.8	−4.62	−3.52	3.29	1 (1) at 1st difference	Stationary

Source: Authors using data from world development indicators with e-views 10

Table 3: Result from ARDL: Dependent Variable: Gross domestic product per capita growth rate

Long-run dynamics			
Foreign direct investment	Gross capital formation	Labour force	Electricity
0.03	0.21	0.84	0.18
(0.00)	(0.20)	(0.18)	(0.98)
[0.02**]	(0.07**)	[0.09**]	[0.22]

Short run dynamics							
Foreign direct investment		Gross fixed capital formation		Labour force		Electricity	
L1D	L2D	L1D	L2D	L1D	L2D	L1D	L2D
0.06	0.30	1.06	2.20	0.11	0.200	0.07	0.06
(0.00)	(0.79)	(0.35)	(0.80)	(0.49)	(0.63)	(0.33)	(0.14)
[0.00*]	[0.01**]	[0.02**]	[0.00*]	[0.191]	[0.19]	[0.55]	[0.13]

The standard error and the probability values are in parenthesis () and [] respectively. *,**, ***means that variables are statically significant at 1%, 5% and 10% respectively, while LD shows that variables are lagged and differenced. Source: Authors' using STATA12

Table 4: Vector error correction model

Endogenous	D_GDPPCGR	D_FDI	D_LABF	D_GFCF	D_ELECT	D_psav	D_cc
Exogenous							
ECterm	−0.45* (0.00)	−0.37* (0.02)	−0.51* (0.04)	−0.51** (0.03)	−0.51* (0.45)	−0.38 (0.42)	−0.61* (0.00)
GDPPCGR (LD)	0.26* (0.00)	6.26 (0.179)	−0.41* (0.00)	−212.73 (0.35)	0.109 (0.38)	0.73 (0.41)	−9.24* (0.00)
FDI (LD)	−0.04 (0.04)	0.05 (0.56)	−11.83** (0.09)	−9.13 (0.60)	0.002** (0.30)	0.07*** (0.90)	−0.16* (0.00)
LABF (LD)	4.09* (0.00)	0.06*** (0.20)	−0.01 (0.809)	0.00 (0.35)	−2.508 (0.53)	−4.08** (0.05)	−2.09* (0.001)
GFCF (LD)	−2.07* (0.00)	0.04*(0.00)	1.60*** (0.08)	1.04* (0.00)	−1.407 (0.56)	1.41 (0.13)	0.01* (0.00)
ELECT (LD)	−0.87* (0.00)	6.32* (0.00)	−293** (0.02)	−95.15 (0.87)	−0.39* (0.08)	−0.04 (0.5)	4.68 (0.03)
AIC: 7.97317			HQIC: 9.21476			SBIC: 52.14865	

"*,**,*** means that variables are statically significant at 1%, 5% and 10% respectively, while LD shows that variables were lagged and differenced based on Akaike information criterion (AIC), Hannan-Quinn information criterion (HQIC) and Schwarz's Bayesian information criterion (SBIC)"

electricity power has the tendency of increasing economic growth by 6%. The policy implication for this is that effort should be made by the government and the power holding company of Nigeria to ensure constant production, distribution and supply of electricity to ensure productivity in the country.

The vector error correction mechanism was used to bring the system back to equilibrium in the long-run in the event of shock in the short-run as presented in Table 4.

5. CONCLUSION

This study investigated the rate at which FDI would be encouraged through the supply of electricity power towards achieving economic growth in Nigeria for the period 1986-2017. The study engaged the trend analysis and the autoregressive distribution lag on the four selected exogenous variables which are the inflows of FDI, labour force participation rate, gross fixed capital accumulation and electricity power supply.

From the results obtained; the trend analysis showed that over the period under study, it was observed that the selected variables do not show a constant trend with the period. From the econometric result, using the autoregressive distribution lag, result showed that in the long run, FDI has the potency of increasing economic growth by 30%. Similarly, labour force increases economic growth by 10%, while electricity consumption increases economic growth by 6%. The result of the electricity consumption is similar to the findings of Matthew et al. (2018).

Given the result obtained, the study recommended that electricity power should be frequently supplied in order to stimulate FDI inflows which will in turn enhance economic growth in Nigeria. This can be done by the Power Holding Company of Nigeria (PHCN) by providing constant supply of electric power in the company for efficient productivity. Other studies should be carried out in this area looking at other factors that can stimulate FDI apart from electricity in Nigeria.

REFERENCES

Alege, P.O., Ogundipe, A. (2014), Foreign direct investment and economic growth in ECOWAS: A System-GMM approach. Covenant Journal of Business and Social Sciences, 5(1), 1-22.

Alam, A. (2013), Electric power consumption, foreign direct investment and economic growth: A comparative study of India and Pakistan. World Journal of Science, Technology and Sustainable Development, 10(1), 55-65.

Alvarado, R., Ponce, P. (2017), Foreign direct investment and economic growth in Latin America. Economic Analysis and Policy, 56, 176-187.

Ibrahiem, D.M. (2015), Renewable elecricity consumption, foreign direct investment and economic growth in Egypt: An ARDL approach. Procedia Economics and Finance, 30, 313-323.

Long, D.L., Ngoc, B.H., My, D.T.H. (2018), Foreign direct investment,electricity consumption and economic growth in Vietnam. International Journal of Energy Economics and Policy, 8(3), 267-274.

Makiela, K., Outtara, B. (2018), Foreign direct investment and economic growth: Exploring transmission channels. Economic Modelling, 72, 296-305.

Matthew, A.O., Ede, C., Osabohien, R., Ejemeyovwi, J., Fasina, F.F., Akinpelumi, D. (2018), Electricity consumption and human capital development: Exploring the implications for economic growth in Nigeria. International Journal of Energy Economics and Policy, 8(6), 1-8.

Osabohien, R., Osabuohien, E., Urhie, E. (2018), Food security, institutional framework, and technology: Examining the nexus in Nigeria using ARDL approach. Current Nutrition and Food Science, 14(2), 154-163.

Sunde, T. (2017), Foreign direct investment, exports and economic growth: ADRL and causality analysis for South Africa. Research in International Business and Finance, 41C, 434-444.

Zhang, C., Zhou, K., Yang, S., Shao, Z. (2017), On electricity consumption and economic growth in China. Renewable and Sustainable Energy Reviews, 76, 353-368.