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Foreign Direct Investment and Industrial Sector Performance: Assessing the Long-Run Implication on Economic Growth in Nigeria

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Abstract

This paper aimed at examining the impact of Foreign Direct Investment (FDI) and Industrial Sector Performance on economic growth in Nigeria. This study utilized annual time series data for the period 1981-2015 using elaborate econometric analysis which tests the sensitivity of GDP to shocks in FDI and Industrial Sector Output, using the Impulse Response Functions (IRFs) and Variance Decomposition (VDC) techniques within a Vector Autoregressive (VAR) framework. The Johansen Cointegration test result reveals the absence of a long-run relationship between FDI, Industrial Sector Output and GDP. The result also shows the existence of a bidirectional relationship between FDI and Industrial Sector Output, GDP and Industrial Sector Output, with a unidirectional causality running from FDI to GDP. The VAR estimate shows that FDI had a slight significant positive impact on GDP, while Industrial Sector Output had a small significant positive impact on GDP at present, with a negative relationship observed at previous periods. The impulse response functions clearly reveal that GDP exhibited negative response to shocks in FDI up to the 3rd period, while the effect was positive from the 4th period henceforth, while GDP also exhibited a negative response to shocks in Industrial Sector Output throughout the period observed. The variance decomposition analysis further revealed that GDP was mainly driven by shocks in FDI, with industrial sector output contributing very little. The study concludes that Nigeria is yet to fully reap the benefit of FDI since its contribution to GDP is still very low at the moment, whilst the contribution of the industrial sectorin the country has not be vibrant enough to spur economic growth. The study therefore recommends among other things that social and economic infrastructure be improved as this will help lessen the burden of industrialist and eventually lower the cost of doing business and in turn attract FDI inflow into Nigeria.

Keywords

Foreign Direct Investment, Industrial Sector Output and Economic Growth

1. Introduction

Traditionally, industrialization is seen as a sin qua non for sustainable economic growth, but this has not been so in Nigeria, as policies created towards achieving this dream appeared to have little or no significant effect on economic growth. The mainstay of the Nigerian economy for decades now have been earnings from crude oil, with the country's budget been prepared based on forecasted price per barrel of crude oil. It suffices to state that the oil and gas sector accounted for over 95% and about 85% of government revenue, while also contributing 14.8% & 13.8% to GDP in 2011 and 2012 respectively. In contrast, the industrial sector accounted for only 6% to GDP in 2011 [1]. Meanwhile, [2] in a reaction to the poor performance of the industrial sector stated that industrial policies, objectives and strategies were often subject to modifications, neglect or even total abandonment. He further adjudged that industrial policies were pursed on ad-hoc basis and in a most uncoordinated manner in Nigeria. As a result, such policies can never promote a holistic growth in the country's GDP.

According to [3] Foreign Direct Investment (FDI) is on the increase at an extra ordinary speed in the 21st century. It is therefore on record that the USA, France, Netherlands and Britain are among the major countries that supply foreign capital to Nigeria and that the bulk of this capital goes into the oil sector [4]. Nigeria as the largest economy in Africa has attracted significant amount of FDI inflow in recent years. According to [5], Nigeria saw its FDI inflow decline in 2015 by 27% to $3.4 billion as the nation was hard hit by the global drop in oil price, against this backdrop she accounted for about 6% of FDI inflow to Africa and received approximately 31% of the sub-regional total, with the oil and gas sector alone receiving about 70% of the FDI inflow. This therefore clearly shows that FDI over the years domiciled mainly in the now gloomy oil sector in Nigeria, hence contributing to the underdevelopment of the industrial sector. This big question then comes to mind, do these FDIs really impact positively on economic growth in Nigeria? If yes, then sustainability is necessary. Accordingly, this paper is organised as follows; the section two considers the problem statement, section three the review of literature, section four is concerned with the methodology, section five presents the result and discussion of findings, section six examines model diagnostics, whilst section seven focuses on the conclusion and recommendations.

2. Problem Statement

According to [6] a country is said to be industrialized when at least one-quarter of its Gross Domestic Product (GDP) is produced in its industrial sector. An in-

dustrial sector that does not contribute at least one-quarter of the country's GDP is widely viewed as a major challenge facing a country's economic growth. In spite of the enormous revenue gotten from the sale of crude oil, the [7] has shown that majority of Nigerians live below poverty line, with over 80 million or 64% of the population living on less than two dollars a day. Likewise, [8] also ranks Nigeria 158 out of 188 countries, which is a significant decrease in its human development ranking of 153 in 2013; and [9] have placed Nigeria within the 47 poorest countries of the world. The lingering issue of poverty and underdevelopment can be traced to corruption, gross mismanagement, underutilization of available resources and the overdependence on crude-oil revenue which has led to Nigeria been a mono-economic nation, all these have eventually robbed off on the industrial sector which would have eventually opened opportunity for job creation and economic development.

As shown in Figure 1, the growth rate of the Nigeria industrial sector over the years has witnessed a series of ups and down. In 2001-2003, industrial growth rate witnesses a steady rise, but this was ephemeral, as it declined again in 2004, a steady decline was observed from 2010-2013. In 2015 the growth rate plummeted to an all-time low of −2.60. Despite several policies enacted by the government to ensure an extensive growth in the sector, why has the Nigerian Industrial sector growth rate remain very unstable over the years?

Furthermore, comparing Nigeria to Indonesia and Malaysia (which are developing/middle income countries) in terms of industry value added (% of GDP) from 1981 to 2015, Nigeria's industrial performance was the lowest. On the average, Malaysia recorded 42%; Indonesia attained 49% while Nigeria recorded 37%. From Figure 2, the growth of Nigeria's industrial sector value as a % of GDP fluctuated severely as compared to Indonesia and Malaysia which were relatively stable. The industrial sector of Nigeria value added (% of GDP) began to witness a steady decline from 2011 till 2015. Despite the peak moments the

Figure 1. Industry production growth rate for Nigeria, 2000-2015. Source: CIA world fact book.

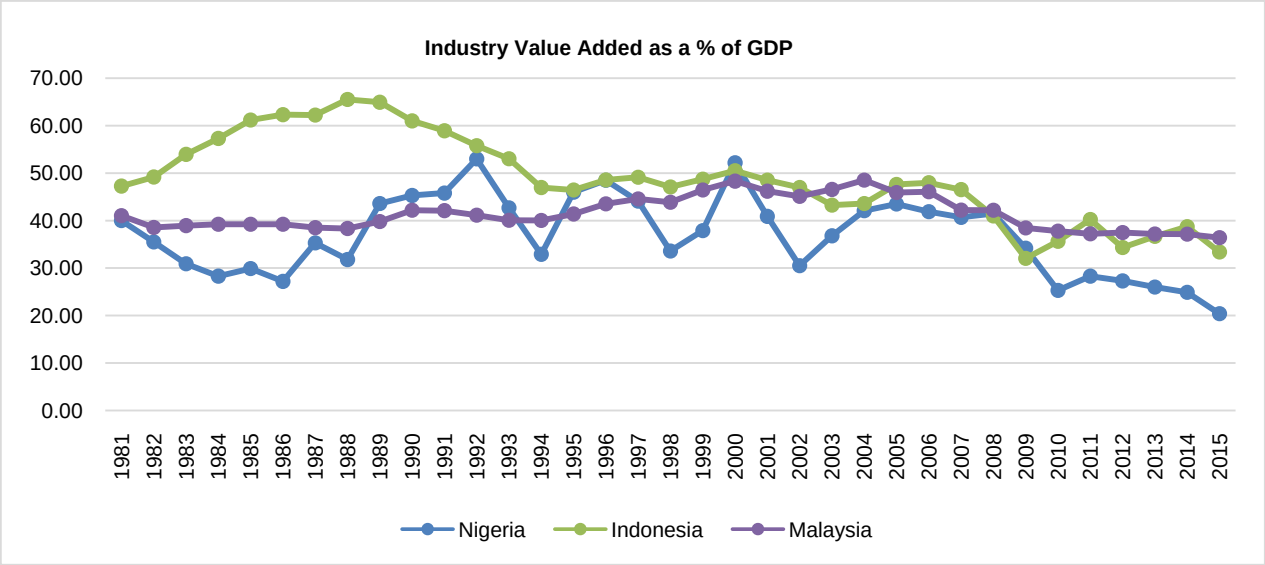

Figure 2. Industry value added as (% of GDP) for Nigeria, Indonesia and Malaysia, 1981-2015. Source: World bank development indicators.

industrial sector attained in Nigeria in 1992, 1996 and 2000; these growth rates where relatively low compared to that of Indonesia and Malaysia as shown in Figure 2.

According to [10] despite the widely publicized theory linking FDI to economic growth, it is on record that FDI inflows have not really translated to growth in developing nations. With the substantial rise in FDI into Nigeria in years past, little or no impact has been seen on job creation, technology transfer and economic growth. According to [5], majority of the foreign capital coming into Nigeria are mainly domiciled in the Oil and Gas Industry, with multinational corporations such as Shell, Chevron, Total and Exxon Mobil among those bringing a substantial sum of this FDI. This Oil and Gas sector domiciled FDI could be linked to the return on investment been higher, requiring advanced technical skills which is unavailable locally, creating a situation where much of the manpower is sourced abroad, thereby creating unemployment. If Nigeria is to reap more in terms of sustainable economic growth from the flow of FDI, measures must be taken to channel foreign capital into other sectors of the economy such as the Industrial Sector by making such sectors attractive to potential investors while also putting other necessary infrastructure in place to enhance a smooth transition of foreign capital.

3. Review of Literature

Some extant empirical literatures showing the nexus between FDI, industrial sector performance and economic growth were explored for better understanding;

3.1. FDI and Economic Growth

Economic literature is packed with studies on the nexus between foreign direct

Investment and economic growth. This stems as a result of its numerous advantages which includes accelerating long term economic growth, transfer of technology not available locally and technical skills in other to boost local manpower. [11] in their study on foreign direct investment, trade and economic growth in Bangladesh using annual time series data from 1973-2004 within the VECM framework observed that FDI has a positive significant impact on economic growth. [12] employing the multiple regression technique examined the effect of foreign direct investment on economic growth in Nigeria, using annual time series data from 1981-2015 found that foreign direct investment has a positive and significant effect on gross domestic product.

[13] examined the effect of foreign direct investment on economic growth in Nigeria using annual time series data covering the period 1979 to 2013. The data were analyzed using Error Correction Model. The results reveal that FDI has both immediate and time lag effect on Nigeria economy in the short run but has a non-significant negative effect on the Nigeria economy in the long run. [14] studied the effects of foreign direct investment and firm export on economic growth in Uzbekistan. The study covered the period 1990-2014 and descriptive method was adopted. He found that an increase in FDI may cause firms to increase their export of products.

[15] investigated the relationship between foreign capital inflows and economic growth in Nigeria for the period of 1981-2014 using the Toda Yamamoto test of causality. Their findings revealed that a bi-directional causality runs from GDP to FDI as well as from FDI to GDP. [16] investigated the relationship between economic growth and foreign direct investment in Nigeria from 1981-2013 within the VECM (Vector Error Correction Model) framework, found a positive and significant relationship between economic growth and foreign direct investment.

[17] examined the relationship between foreign direct investment (FDI) and economic growth in the five BRICS economies over the period 1989-2012 and found that foreign direct investment and economic growth are co-integrated at the panel level, indicating the presence of a long-term equilibrium relationship between them. [18] examined the relationship between foreign direct investment and economic growth in Nigeria from 1981-2013 using the Bounds testing approach and Autoregressive Distributed Lags (ARDL) model. His findings showed that in the short run, FDI has a small positive but insignificant effect on growth while in the long run, it has a small negative and insignificant effect.

[19] examined the foreign capital flow effects on the European Union (EU) economic growth during 1987-2012 and found that the higher foreign direct investment (FDI) and portfolio investment (FPI) triggered by the European Monetary Union (EMU) have not contributed to growth. The lack of the FDI effect is surprising as they bring enormous benefits. [20] studied the impact of foreign direct investment on economic growth of Pakistan covering the period 1995 to 2011, using the Ordinary Least Square Regression, they found that FDI impacts positively on economic growth of Pakistan. [21] studied the causal relationship

between foreign direct investment and economic growth in Nigeria from 1970-2013. Using Granger causality, they found that foreign direct investment granger causes economic growth both in the short and long run in Nigeria.

3.2. Industrial Sector Performance and Economic Growth

Few studies have examined the relationship between industrial sector performance and economic growth. [22] within the ARDL (Autoregressive Distributed Lag) framework ascertaining the relationship between industrial performance and macroeconomic factors in Ghana from 1980-2013. Their findings indicate a cointegrating relationship between industrial output and macroeconomic factors, they opined that the major macroeconomic factors affecting industrial performance in Ghana were lending rate, inflation, employment and government expenditure. Based on the findings, they recommend that the government of Ghana stabilize the macroeconomic environment in order to achieve industrial growth and development. [6] investigated the effect of industrial development on the Nigeria's economic growth from 1973-2013 using OLS (Ordinary Least Square) regression they found that the influence of industrial output on economic growth is not statistically significant. They further recommend that the government and its agencies ensure political stability and also implement strategic policies that will create a fair playing ground for foreign investors which will also improve the establishment of industries especially the manufacturing industries to encourage industrialization of the Nigerian economy as this will facilitate the strengthening of economic growth. [23] adopted the error correction model to ascertain the impact of fiscal policies on the output of the manufacturing sector in Nigeria from 1990-2010. Their findings showed a negative significant relationship exist between government tax revenue and manufacturing sector output in Nigeria, while a significant positive relationship exist between Government expenditure and the output of the manufacturing sector in Nigeria. they further recommended that the government embark on expansionary fiscal policies because such policies have the propensity to accelerate manufacturing production in Nigeria.

[24], using the VECM model explored the long-run implications of industrial production and non-oil export on economic growth in Nigeria from 1970-2006, they found that a unidirectional causality runs from industrial sector output to economic growth. Their result further reveals that a 100 percent rise in industrial production in one lag period in the short run will lead to 76% rise in non-oil export production and a 7% rise in GDP in the current period. According to [25], he opined that there is a positive correlation between the level of industrialization and per capita income for developing countries.

[26] while estimating the relationship between Economic growth, Investment and Export in Nigeria opined that industrial production has the ability to increase investment which will further lead to the production of more good and eventually result to growth in the domestic economy. [27] employing the ARDL (Auto-regressive distributed Lag) bounds examined the nexus between indu-

strialization, electricity supply and economic growth in Nigeria. He found a bi-directional causality between GDP and electricity supply, however only a unidirectional relationship was observed between capital employed and GDP. The research finally confirmed that electricity supply, technology and capital employed were necessary for industrial and GDP growth in Nigeria.

[28] within the framework of Granger causality, found a bi-causal relationship between industrial growth and GNP. Their empirical findings further indicate that the industrial sector and overall economy are co-integrated and have a long run relationship in Mexico. [29] examine the pattern of long run relationship between exports earnings and industrial activities in Bangladesh. Their findings revealed the existence of a bi-directional causality between exports and industrial activities in Bangladesh. Thus, the authors therefore opined that a viable industrial sector was necessary to drive Bangladesh external trade.

[30] also found a positive association between export growth, industrial production and economic growth for India as well as other South Asian economies. Likewise, [31] argued that industrialization through foreign investors can positively influence economic growth. They further opined that the contribution of industrialization to economic growth rate is dependent on the threshold level of income.

[32] posits that there exists a higher marginal product of labour from the industrial sector than the agricultural sector in Nigeria and so the transferring of resources for the agricultural sector to the industrial sector raises total productivity in the economy.

This study is therefore significant in the light that, previous studies have researched on the contribution of FDI to economic growth in Nigeria, likewise a few have delved into the performance of industrial sector on economic growth in Nigeria, this work to the best of our knowledge is the first to access the joint impact of FDI and Industrial Sector Performance on Economic Growth in Nigeria.

4. Methodology

4.1. Sources of Data

The study utilized annual time series data for the period 1981-2015, obtained from Central Bank of Nigeria (CBN) [33]. The data used includes three variables; Foreign Direct Investment (FDI), Industrial Sector Output (IND), and Economic Growth proxied by GDP (Gross Domestic Product).

4.2. Analytical Technique

The study employed the Vector Autoregressive (VAR) model to investigate the interaction among the variables adopted for the study. However, before the estimation of the VAR model, the properties of the variables were diagnosed for stationarity and long-run relationship. The Augmented Dickey Fuller (ADF) and Philips Perron (PP) unit root test was used to access the stationarity and order of

integration.

The Johansen cointegration technique was employed to check for the existence of a long-run equilibrium relationship among the variables, since it has the advantages amongst others for allowing for more than one cointegration equation. While the Granger Causality test was used to determine the causal relationship among the variables.

Furthermore, an Impulse Response Function was carried out to explain and trace the effect on present and future values of the endogenous variable to one standard deviation shock to one of the innovations. A Variance Decomposition Test was also conducted to access the response of economic growth (GDP) to foreign direct investment (FDI) and industrial sector output (IND) in the VAR. Finally, all statistical estimation was done using E-Views 9 software.

4.3. Model Specification

The VAR model adopted for the study is specified below:

$$\log\mathrm{GDP}_t = a_1 + \sum_{j=1}^{n} \beta_j \log\mathrm{GDP}_{t-1} + \sum_{j=1}^{n} \theta_j \log\mathrm{FDI}_{t-1} + \sum_{j=1}^{n} \Upsilon_j \log\mathrm{IND}_{t-1} + \mu_{1t} \quad (1)$$

$$\log\mathrm{FDI}_t = a_2 + \sum_{j=1}^{n} \theta_j \log\mathrm{FDI}_{t-1} + \sum_{j=1}^{n} \beta_j \log\mathrm{GDP}_{t-1} + \sum_{j=1}^{n} \Upsilon_j \log\mathrm{IND}_{t-1} + \mu_{2t} \quad (2)$$

$$\log\mathrm{IND}_t = a_3 + \sum_{j=1}^{n} \Upsilon_j \log\mathrm{IND}_{t-1} + \sum_{j=1}^{n} \theta_j \log\mathrm{FDI}_{t-1} + \sum_{j=1}^{n} \beta_j \log\mathrm{GDP}_{t-1} + \mu_{3t} \quad (3)$$

where;

GDP = Gross Domestic Product

FDI = Foreign Direct Investment

IND = Industrial Sector Output

μ = Stochastic error term called shocks or impulses or innovations in the VAR

t = Current time

5. Results and Discussion of Findings

5.1. Unit Root Test

According to Table 1, the ADF and PP Test shows that economic growth (GDP), foreign direct investment (FDI) and industrial sector output (IND) attained stationarity at first differencing.

5.2. VAR Lag Order Selection Criteria

Table 2, shows the optimum lag structure for the VAR. The results depict that

Table 1. Unit root test results.

Variables	ADF TEST	Remarks	PP TEST	Remarks
logFDI	−4.594683*	1(1)	−4.594683*	1(1)
logIND	−5.203658*	1(1)	−6.620452*	1(1)
logGDP	−7.848577*	1(1)	−8.46856***	1(1)

*/**/***, indicates significance at 1%, 5% and 10% respectively. Source: Authors Computation Using Eviews 9.

majority of the selection criteria, such as the Final Prediction Error, Akaike Information Criterion and Hannan-Quinn Information Criterion, selected the optimum lag length of 2 at 5% level of significance. Hence the Lag length of 2 will be used in estimating the VAR, Johansen Cointegration Test and Granger Causality Test.

5.3. Cointegration Test

According to Table 3 below, the outcome of the cointegration test employed using both the trace and max-eigen test statistics indicates the absence of a long-run relationship among the three variables at 5% level of significance, thereby leading to the acceptance of the null hypothesis of no cointegration. From the result it is therefore evident that foreign direct investment (FDI), industrial sector output (IND) and economic growth (GDP) are not cointegrated.

5.4. VAR Model Estimation

From Table 4, the VAR estimate results depicts that the coefficient of determination with an $R^2$of 0.998486 implies that 99.85% of the total variation in economic growth (GDP) is explained by the independent variables. While the adjusted R^2 of 0.998136 or 99.81% suggested that the independent variable was robust in explaining the variation in economic growth (GDP), thereby indicating a good fit. The Durbin Watson (DW) test statistic with a value of 2.171047 indicates the nonexistence of positive first order serial correlation. Also the standard error of 0.092829 signifies that about 9.28% of the variation in the dependent variable will not be explained by the explanatory variables. Likewise, the F-Statistics of 4397.638 indicates that the model is significant at 1% level and is a

Table 2. VAR lag order selection criteria.

Lag	Log L	LR	FPE	AIC	SC	HQ
0	−91.05857	NA	0.086703	6.068295	6.207068	6.113532
1	18.72971	191.2441*	0.000131	−0.434175	0.120917*	−0.167092
2	28.49809	15.12523	0.000126*	−0.483747*	0.487663	−0.253229*
3	34.76634	8.492476	0.000159	−0.307506	1.080224	0.144859
4	48.74100	16.22863	0.000127	−0.628452*	1.175597	−0.040377

Source: Authors computation using eviews 9.

Table 3. Johansen Co-integration test results.

Hypothesized		Trace	0.05		Max-Eigen	0.05	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**	Statistic	Critical Value	Prob.**
None	0.354720	23.07239	29.79707	0.2425	14.45634	21.13162	0.3288
At most 1	0.170103	8.616050	15.49471	0.4021	6.152955	14.26460	0.5937
At most 2	0.071922	2.463096	3.841466	0.1165	2.463096	3.841466	0.1165

Source: Authors Computation Using Eviews 9.

Table 4. Vector autoregressive estimates.

Dependent Variable: LOG(GDP)				
	Coefficient	Std. Error	t-Statistic	Prob.
Log(GDP(−1))	1.636239	0.273972	5.972289	0.0000
Log(GDP(−2))	−0.701909	0.238323	−2.945202	0.0067
Log(FDI(−1))	7.40E−08	4.30E−08	3.060320	0.0045
Log(FDI(−2))	9.42E−08	2.10E−08	4.070103	0.0003
Log(IND(−1))	0.000801	0.000264	−1.945830	0.0607
Log(IND(−2))	−0.000830	0.000643	1.993716	0.0568
C	0.254206	0.841059	0.302245	0.7649
R-squared	0.998486	Mean dependent var		8.465497
Adjusted R-squared	0.998136	S.D. dependent var		2.150259
S.E. of regression	0.092829	Akaike info criterion		−1.730289
Sum squared resid	0.224047	Schwarz criterion		−1.412848
Log likelihood	35.54976	Hannan-Quinn criter.		−1.623479
F-statistic	2857.306	Durbin-Watson stat		2.171047
Prob(F-statistic)	0.000000			

Source: Authors Computation Using Eviews 9.

good fit. The implication is that the estimates and inferences drawn are reliable.

Furthermore, the results obtained showed that the two lags each of Foreign Direct Investment (FDI) and Industrial Sector Output (IND) were statistically significant in explaining the variations in Economic growth (GDP).

5.5. Granger Causality Test

Table 5, depicts the result of the relationship among the variables. The result suggests that Foreign Direct Investment (FDI) and Industrial Sector Output (IND) causes Economic Growth (GDP), hence the null hypothesis that FDI and IND does not granger causes GDP cannot be rejected. The result also indicates that a bidirectional causality runs IND to GDP, IND to FDI. While a unidirectional causality runs from FDI to GDP.

5.6. Stability Test

To ensure the reliability of the coefficient of the Normalized Cointegration model, the study adopted the AR Root Stability Test. The estimated VAR will be assumed to be stable if all roots fall within the circle. From Figure 3, the outcome implies that the VAR model is stable, since the polynomial roots fall within the unit circle.

5.7. Impulse Response Function Test

The impulse response function are dynamic simulations showing the response of an endogenous variable over time to a given shock. In this regards, Figure 4

Table 5. VAR Granger Causality/Block exogeneity wald tests.

Dependent variable: log(GDP)			
Excluded	Chi-sq	Df	Prob.
Log(FDI)	7.542430	2	0.0230
Log(IND)	5.474710	2	0.0647
All	14.64720	4	0.0055
Dependent variable: log(FDI)			
Excluded	Chi-sq	Df	Prob.
Log(GDP)	2.123782	2	0.3458
Log(IND)	6.431320	2	0.0401
All	11.40050	4	0.0224
Dependent variable: log(IND)			
Excluded	Chi-sq	Df	Prob.
Log(GDP)	5.097708	2	0.0782
Log(FDI)	5.186310	2	0.0747
All	6.330441	4	0.0150

Source: Authors Computation Using Eviews 9.

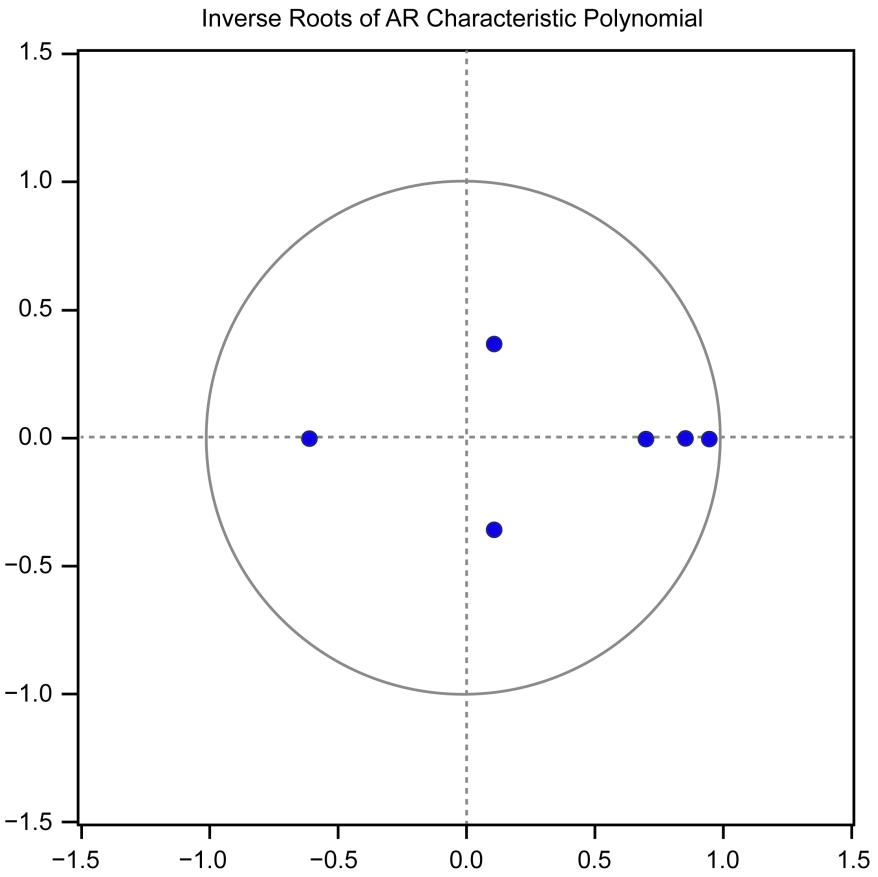

Figure 3. Graph of AR inverse root. Source: Authors computation using Eviews 9.

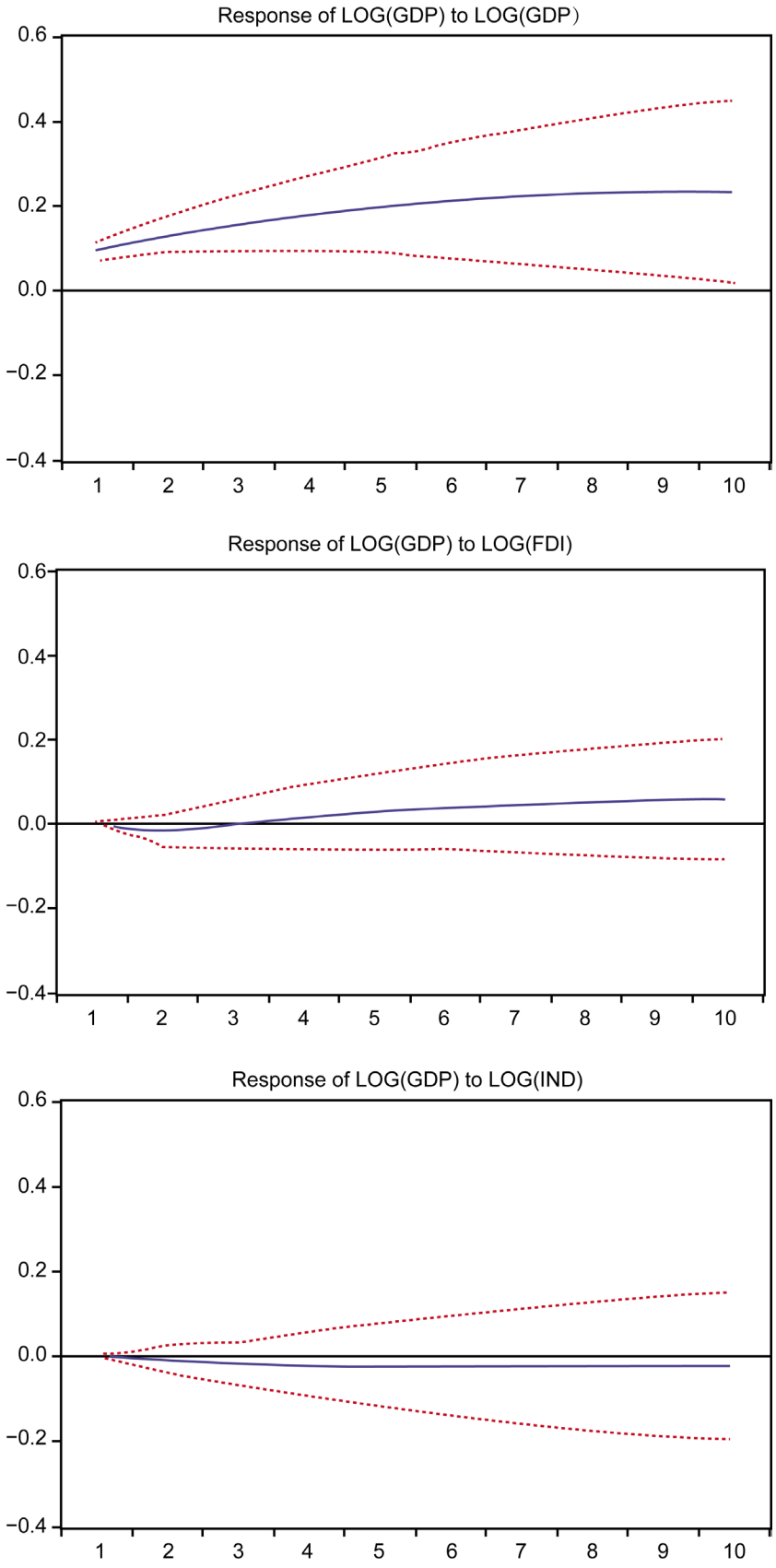

Figure 4. Impulse response function graphs. Source: Authors computation using eviews 9.

shows the impulse response function result of Economic Growth (GDP), Foreign Direct Investment (FDI) and Industrial Sector Output (IND) over a 10-year period.

The first diagram shows the effect of one standard deviation shock from economic growth (GDP) on itself. The effect of this variable on itself was positive in the first period and soared continually, peaking at the tenth period. The second diagram reveals that GDP responded negatively to shocks in FDI up to the 3rd period, while the effect was positive from the 4th period henceforth.

Also, economic growth (GDP) responded negatively to shocks in industrial sector output (IND)from the 1st period till the 10th period. This results shows that the industrial sector has not perform so well in recent times as its impact on economic growth (GDP) has been largely negatively.

5.8. Variance Decomposition Test

The Variance Decomposition as a forecast error decomposition process attempts to determine how much of the forecasted error variance of each of the variables can be explained by the exogenous shocks of other variables in the VAR system, from the short and long run periods. From Table 6, below GDP was largely driven by itself significantly ranging from 100% to 83.76%. Also FDI, which appeared as the second driver of economic growth (GDP) contributed about 4.96% to variations in GDP in the 3rd period and thereafter increased to 12.18% in the 7th period and 14.79% in the 10th period. While variance in GDP caused by industrial sector output (IND) peaked at 1.56% in the 5th period. This results implies that the predominant source of variation in GDP is foreign direct investment (FDI), while industrial sector output (IND) accounts for a very low variation.

6. Model Diagnostics

To ensure that the model is correctly specified and to avoid spurious results, it is

Table 6. Results of variance decomposition analysis of economic growth (GDP).

Period	S.E.	Log(GDP)	Log(FDI)	Log(IND)
1	0.103671	100.0000	0.000000	0.000000
2	0.164145	96.75164	2.268760	0.979597
3	0.218359	93.64100	4.957133	1.401872
4	0.268182	91.12661	7.335905	1.537487
5	0.314237	89.13425	9.301491	1.564262
6	0.356885	87.55311	10.89490	1.551988
7	0.396425	86.28935	12.18354	1.527111
8	0.433134	85.27004	13.23022	1.499736
9	0.467274	84.43987	14.08648	1.473647
10	0.499090	83.75710	14.79279	1.450107

Source: Authors Computation Using Eviews 9.

therefore mandatory to examine for model misspecification which may occur due to unstable parameters and afterward lead to bias estimates. Hence the following test were conducted namely; Autocorrelation, Heteroskedascity and Normality test.

6.1. Autocorrelation Test

Autocorrelation occurs when observations have a natural sequential order. Table 7 shows that the LM-Statistics at lag 1 and 2 with p-values of 0.3060 and 0.2119 respectively indicates the absence of autocorrelation in the model since the p-values are greater than the critical value at 5% level of significance. Thus, we can conclude that there is no presence of autocorrelation in the model.

6.2. Heteroskedascity Test

Heteroscedascity occurs whenever the variance of the unobserved error term **u**, changes across different segments of the population over time. Table 8 below indicates that the VAR Residual Heteroskedasticity test with a chi-square value of 182.7380 and a p-value of 0.1265 confirms the absence of Heteroskedasticity in the model since its p-values are greater than the critical values at 5% level of significance and this ensure the reliability of the VAR model.

6.3. Normality Test

According to Table 9, the result of the Jarque-Bera normality test with a joint

Table 7. VAR residual serial correlation LM tests.

VAR Residual Serial Correlation LM Tests		
Null Hypothesis: no serial correlation at lag order h		
Sample: 1981 2015		
Included observations: 33		
Lags	LM-Stat	Prob
1	10.57514	0.3060
2	12.02533	0.2119
Probs from chi-square with 9 df.		

Source: Authors Computation Using Eviews 9.

Table 8. VAR residual heteroskedasticity tests: Includes cross terms.

Sample: 1981 2015		
Included observations: 33		
Joint test:		
Chi-sq	df	Prob.
182.7380	162	0.1265

Source: Authors Computation Using Eviews 9.

Table 9. VAR residual normality tests.

Orthogonalization: Cholesky (Lutkepohl)			
Null Hypothesis: residuals are multivariate normal			
Sample: 1981 2015			
Included observations: 33			
Component	Jarque-Bera	df	Prob.
1	0.674161	2	0.7139
2	2.114385	2	0.3474
3	0.242199	2	0.8859
Joint	3.030745	6	0.8050

Source: Authors Computation Using Eviews 9.

probability of 0.8050 indicates a validation of the null hypothesis that the residuals are normally distributed.

7. Conclusion and Recommendation

This study focused on the nexus between FDI, Industrial Sector Development and Economic Growth in Nigeria, using data from 1981-2015. The VAR Granger Causality/Block Exogeneity Wald Tests was applied to test causality between FDI, Industrial sector performance and economic growth. The unit root test showed that foreign direct investment (FDI), industrial sector output (IND) and economic growth (GDP) became stationary at first difference. This result further supports the absence of long run relationship among the variables with no evidence of co-integrating variables.

Furthermore, a bi-directional causal relationship was observed between IND and GDP, IND and FDI, while a unidirectional relationship was observed between FDI and GDP. This result give credence to the fact that industrial sector output is pivot to promoting FDI, and vice versa with a resultant trickledown effect of increasing economic growth in Nigeria. Also the VAR estimates showed that both FDI and IND were statistically significant in explaining variations in GDP. The coefficients of FDI were found to be positive and significant at 1% and 5% for lag 1 & 2 respectively with little effect on GDP. This shows that Nigeria is yet to fully reap the benefits of FDI, as its impact on economic growth at the moment is very little. While the coefficient of industrial sector output at lag 2 was found to be negatively significant, indicating a negative impact on GDP. This result give credence to the fact that the industrial sector in the country has not be vibrant enough to spur economic growth.

The Impulse Response Function Test clearly revealed that GDP responded negatively to shocks in FDI up to the 3rd period, while the effect was positive from the 4th period henceforth, while the response of GDP to IND was negative throughout the period observed. This also clearly shows that the industrial sector in Nigeria has not impacted positively on economic growth. Also the Variance

Decomposition Analysis revealed that variation in GDP was mainly affected by shocks of FDI in Nigeria, with the shocks in IND causing very little or no variation in GDP.

To this extent the following recommendations have been made;

1) The electricity situation in the country needed be improved upon as it remains one of the biggest obstacle hindering the industrial sector growth and development.

2) The Bank of Industry (BOI) should do more in empowering industries in Nigeria and creating models that are suitable, given the peculiar nature of our economy.

3) Social and economic infrastructure in terms of good transportation network be improved by the government as this will help lessen the burden of industrialist and equally lower the cost of doing business, thereby attracting FDI into the country.

4) The legal and supervisory framework within the Credit Guarantee Scheme should be strengthened to enable appropriate use of funds and also deal with loan defaulters.

5) Proper management of existing industries is encouraged in other to enhance a positive impact on the economy.

6) Industrialization policies by the government should be one that creates a fair playing ground for foreign investors as this will go a long way in increasing our FDI and in the long run enhance economic growth.

7) The security level in the country should be tightened in order to encourage foreign investors' confidence, as instability anywhere in the country will scare away prospective investors.

8) Policies should be enacted and strengthened by government to limit the repatriation of profits by foreign firms and ensure reinvestment of profit in the Nigerian economy.

9) Policies makers should learn to appreciate the effects of lag in order to ensure accurate timing of policies in other to ensure their positive impact on the economy.

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Appendix 1.

Vector Auto regression Estimates

Date: 04/12/17 Time: 20:17

Sample (adjusted): 1983 2015

Included observations: 33 after adjustments

Standard errors in ( ) & t-statistics in [ ]

	LOG(GDP)	LOG(FDI)	LOG(IND)
LOG(GDP(−1))	1.636239	1.804440	2.101951
	(0.27397)	(1.23827)	(0.93496)
	[5.97229]	[1.45723]	[2.24818]
LOG(GDP(−2))	−0.701909	−1.514014	−1.711501
	(0.23832)	(1.07714)	(0.81330)
	[−2.94520]	[−1.40558]	[−2.10439]
LOG(FDI(−1))	7.40E−08	0.105844	0.076106
	(4.30E−08)	(0.17377)	(0.13120)
	[3.060320]	[0.60912]	[0.58007]
LOG(FDI(−2))	9.42E−08	0.427878	−0.047747
	(2.10E−08)	(0.16857)	(0.12728)
	[4.070103]	[2.53828]	[−0.37514]
LOG(IND(−1))	0.000801	−0.112502	0.388594
	(0.000264)	(0.38537)	(0.29097)
	[−1.945830]	[−0.29193]	[1.33550]
LOG(IND(−2))	−0.000800	0.060336	0.216351
	(0.00643)	(0.32832)	(0.24790)
	[1.993716]	[0.18377]	[0.87273]
C	0.254206	7.968290	1.449234
	(0.84106)	(3.80132)	(2.87020)
	[0.30224]	[2.09619]	[0.50493]
R-squared	0.998486	0.886880	0.985708
Adj. R-squared	0.998136	0.860775	0.982410
Sum sq. resids	0.224047	4.576734	2.609209
S.E. equation	0.092829	0.419557	0.316787
F-statistic	2857.306	33.97393	298.8651
Log likelihood	35.54976	−14.22886	−4.956875
Akaike AIC	−1.730289	1.286598	0.724659
Schwarz SC	−1.412848	1.604039	1.042100
Mean dependent	8.465497	21.18716	13.76938
S.D. dependent	2.150259	1.124430	2.388537
Determinant resid covariance (dof adj.)		6.45E−05	
Determinant resid covariance		3.16E−05	
Log likelihood		30.52819	
Akaike information criterion		−0.577466	
Schwarz criterion		0.374857	

Source: Authors Computation Using Eviews 9.

Appendix 2.

Date: 04/11/17 Time: 15:13

Sample (adjusted): 1983 2015

Included observations: 32 after adjustments

Trend assumption: Linear deterministic trend

Series: LOG(RGDP) LOG(FDI) LOG(IND)

Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None	0.354720	23.07239	29.79707	0.2425
At most 1	0.170103	8.616050	15.49471	0.4021
At most 2	0.071922	2.463096	3.841466	0.1165

Trace test indicates no cointegration at the 0.05 level

*denotes rejection of the hypothesis at the 0.05 level

*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.354720	14.45634	21.13162	0.3288
At most 1	0.170103	6.152955	14.26460	0.5937
At most 2	0.071922	2.463096	3.841466	0.1165

Max-eigen value test indicates no cointegration at the 0.05 level

*denotes rejection of the hypothesis at the 0.05 level

*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b' * S11 * b = I):

LOG(RGDP)	LOG(FDI)	LOG(IND)
−4.276645	−0.530103	4.099318
2.229029	−2.754058	−0.804979
0.928141	0.376997	−0.566263

Unrestricted Adjustment Coefficients (alpha):

D(LOG(RGDP))	0.011394	0.001773	−0.022509
D(LOG(FDI))	0.021769	0.166834	0.012551
D(LOG(IND))	−0.105543	0.000777	−0.067504
1 Cointegrating Equation(s):		Log likelihood	26.22017

Normalized cointegrating coefficients (standard error in parentheses)

LOG(RGDP)	LOG(FDI)	LOG(IND)
1.000000	0.123953	−0.958536
	(0.16315)	(0.07139)

Continued

Adjustment coefficients (standard error in parentheses)			
D(LOG(RGDP))	−0.048730		
	(0.06905)		
D(LOG(FDI))	−0.093099		
	(0.32996)		
D(LOG(IND))	0.451370		
	(0.23372)		
2 Cointegrating Equation(s):		Log likelihood	29.29665
Normalized cointegrating coefficients (standard error in parentheses)			
LOG(RGDP)	LOG(FDI)	LOG(IND)	
1.000000	0.000000	−0.904068	
		(0.02401)	
0.000000	1.000000	−0.439429	
		(0.06110)	
Adjustment coefficients (standard error in parentheses)			
D(LOG(RGDP))	−0.044778	−0.010923	
	(0.07785)	(0.04527)	
D(LOG(FDI))	0.278778	−0.471010	
	(0.33961)	(0.19750)	
D(LOG(IND))	0.453102	0.053808	
	(0.26356)	(0.15327)	

Source: Authors Computation Using Eviews 9.