



## Analysis of Globalization and Industrial Production in Nigeria—An Error Correction Modeling Approach

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### Abstract

The importance of globalisation in the development of the global economy has gained significant backing over the years, as long-run global projections are sustained. Without doubt, it is strappingly believed that, there is more to gain about several striking issues that are essential in the current trend towards globalisation. Consequently, this study seeks to ascertain the bi-directional relationship (if any), between globalisation and industrial production in the context of Nigeria, with annual time series data spanning 1981-2015, employing Cointegration and Error Correction Modelling (ECM) approach. The study however utilised the approach advanced by Tamuno and Edoumiekumo (2012). Results from the error-correction model revealed that, about 65 percent of the short run shocks in industrial production is significantly corrected every 12 months. This is suggestive of a high speed of adjustment of industrial production to its long run stability. The result also revealed the presence of a positive correlation between industrial production and foreign direct investment as well as openness to trade, while a negative linkage was found in the case of exchange rate and industrial production in Nigeria. The study therefore recommends among others that; efforts should be made by all strata of government within the country to put in place appropriate strategies that would promote investment-friendly environment aimed at attracting the right kind and quality of FDI into the industrial sector; the Federal government should ensure and encourage the production of non-primary, non-oil export commodities and intermediate inputs to enhance the competitiveness of the Nigerian industrial sector, boost the positive influence of trade openness on industrial production and reduce the negative effects of exchange rate fluctuations, in order to ensure swift convergence in Industrial outputs in the long run.

**Keywords:** Globalisation, Industrial Production, Trade Openness, FDI, Error Correction Modelling

**JEL Classification:** F6, L5, L6, O14

**Paper Classification:** Research Paper

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### Introduction

Globalization is the buzz-word of today, countries of the world are being increasingly connected as new communication and technology has brought people closer. The phrase “the world has become a global village” is a common word of today, which signifies how much has changed in the past few decades (Pillai, 2016). To the best knowledge of the authors, previous studies on this topic are minute and shallow.

The nexus between globalization and industrial sector development has received significant attention in the developing world. Globalization is a multifaceted concept, whose meaning, processes and implications for developing countries has been a subject of debate. Globalization can also be perceived as a channel through which individuals around the globe are integrating into a unified geographical entity. In this process, there is a combination of technological, socio-cultural, economic, and political forces (Nguyen, 2010). The growing importance of globalization is evident on the increasing interdependence of both advanced and developing countries. As a result of the growing integration and trade liberalization (a bye product of globalization) among economies and societies around the world, it has become increasingly easy for the exchange of local resources, raw material, human resource and intellectual skills, which enhances industrial production among all countries involved.

Globalization is often seen by some academicians as inevitable, beneficial, and irreversible; while some other scholars, believe that it leads to inequality within and among nations, threatens social security and progress and also creates unemployment (Czenter, 2002). This signifies that globalization could lead to several opportunities and threats in most nations of Sub-Saharan Africa (Mugabe, 2002). Different opinions on how well developing countries, especially in Sub-Saharan Africa are engaged in the globalization of global economies. This is as a result of the multifaceted process of globalization which has great potentials to change the social, economic and political history in many nations (Cap, 2002).

Efemini (2003) posit that internationalization through globalization influences different countries differently. Studies on the influence of globalization on different facet of the Nigerian economy receive much attention, but its effect on industrial production and development had not received much attention. The Nigerian industrial sector is quite underdeveloped. The country still depends on the importation of productive inputs despite all efforts to develop her local resources. According to Central Bank of Nigeria, Industrial production averaged 1.81 per cent of GDP from 2007 until 2015, reaching an all-time high of 20.10 per cent in the first quarter of 2011 and a low record of -6.60 per cent in the second quarter of 2015 (Trading Economics, 2016). From the indices above, Nigerian industrial sector can be said to be lacking the necessary characteristics of an industrialized society. Due to the current falling oil price, which have been Nigeria's so called fountain of wealth, figuratively speaking.

The negligence of agriculture in Nigeria, has denied many local manufacturers and infant industries their primary source of raw materials and the absence of locally sourced raw materials has resulted to the slow pace of industrial growth. As countries become increasingly connected together, there is a tendency for the increasing interdependence and development of all countries involved, as it is often said, 'No Country Can Survive on Its Own'.

## Literature Review

Theories and empirical evidence on globalization and industrialization are so overwhelming. While there are concerns in the literature on the vital positive roles that globalization has on the growth of the industrial sector of developed countries, a wide gap exists on industrial performance particularly in developing countries and Nigeria inclusive.

The industrial development of any nation is critical issue because it ultimately forms the apex of economic growth and development which is desired by every economy (Todaro, 2010). The outcome of growth and development is what generates into the numerous strata of development indices that are often enjoyed by the growing economy.

Oyefusi and Udoh (2004) in their analysis of openness, economic growth and trade liberalization in developing countries asserted that trade openness is a necessary determinant of economic growth, in which a developing country must follow in order to achieve sustainable growth and development. The empirical result, however argued that the potential of an economy to yield benefits from globalization or trade liberalization is heavily dependent on adequate and appropriate domestic policies, the capacity for strategic government intervention, adequate human capital and proper harnessing of the socio-economic factors supportive of growth. From their conclusion, it may be right to infer that the lack of positive influence of globalization and liberalization on Nigeria is due largely to the failure of the country to possess these necessary preconditions.

Sede and Izilein (2013) divulged from the study of examining the influence of globalization on economic growth and development to investigating the causal interaction between globalization, economic growth and development in Nigeria. The study investigated a causal relationship between globalization proxied by Trade Openness and economic growth captured by GDP Growth rate. The Granger causality results clearly showed that Openness does not cause GDP growth rate thus the null hypothesis was accepted at 5 per cent level of significance. The analysis also discovered that crude oil export featured dominantly in the Nigerian export table and trend which by extension made the rigidly dependent on crud oil.

Tamuno and Edoumiekumo (2012) investigated the influence of globalization on industrial production in Nigeria, annual time series data covering the period 1970-2008 was employed. The empirical framework of co-integration test and error correction mechanism was also employed in the course of the study. The Co-integration test result showed presence of positive long run relationship among the variables employed in the model. The error correction model results for short run dynamics depicts that gross capital formation, nominal exchange rate, external debt and degree of openness negatively impact on the industrial production in Nigeria, while FDI positively impacts on Nigeria's industrial output.

In their analysis, Aluko, Akinola and Fatokun (2004) investigated the influence of globalization on the Nigerian industrial sector with particular emphasis on textile firms selected from Asaba, Lagos and Kano. Conclusions from this study clearly show that globalization or internationalization has had an inverse influence on the industrial sector.

### **Characteristics of Globalization**

Globalization is a multifaceted concept which has numerous characteristics. Economically, globalization can be understood as opening up a country market, commerce and free trade among nations and integration of national economies with the global economy. Geographically, it can be seen as, unprecedented huge migrations of people from their country to other countries, creating multi-culturalism in many countries.

Globalization entails the right of the industrialist or businessmen to innovate or establish industry or commerce either in his country or globally. It is also concerned with the liberal exchange of capital goods, technologies and services between nations Globalization has also led to the connection of local community with the global economy by breaking down national hindrances and boundaries to trade, establishing of strategic linkages between societies and nations involved, by means of international transfer of knowledge, culture, literature, information and technology.

Globalization can be traced to MNCs (multinational corporations) based in developed countries. Civilization, industrial capital, Technologies, products and services, comes from these developed nations to developing countries. In other words, the developed culture of the north (developed countries) is being transferred to the South (developing countries). Globalization leads to increase in information dissemination and greater transporter of data between geographically remote locations. Obviously, this is made possible with the advent of satellite, fibre optic communications and increased availability of wireless telephone and Internet. Globalization, also leads to the diffusion of technologies and ideas through rapid extension of a globalize transportation and communication system. This has led to rapid growth in international financial transactions and a surge in foreign direct investment, largely contributed by multinational corporations and fast growth in trade, especially among multinational corporations.

### **Determinants of Industrial Production**

Industrial production with great emphasis on manufacturing is a key for economic development as it has several advantages for a developing economy which includes; unemployment reduction, technological transfer, increased local sourcing of raw materials and development of local industrial technology, economic diversification and welfare improvement. There are several determinant of industrial production and they include; financial development, macroeconomic stability, good governance, economic openness, internal and external demand, exchange rate and human capital.

The presence of good governance, capable of encouraging and guaranteeing transparency, absence of corruption, better rule enforcement and government stability could lead to improved investment and stimulate positive entrepreneurial and innovative spirit. On the contrary, the presence of governance deficiencies could make it difficult to building up a developed industrial sector and by extension it could complicate the effectiveness of appropriate industrial policies.

The increasing openness of an economy is an inevitable determinant of industrial production in a country. As a result of trade openness, it becomes easy to source for intermediate input; raw material and skills from industrialize countries thereby boosting industrial production.

The maintenance of a stable exchange rate proves to be important in determining industrial production as it affects economic growth in the long run. Therefore, avoiding exchange rate misalignments and maintaining a stable rate of exchange could protect exporters from an overvaluation phenomenon that affects market competitiveness.

### **Situational Analysis of Industrial Production in Nigeria**

Industrial production Nigeria depicts an archetypal display of sheer neglect of an essential sector of the economy. This stems deeply from series of policy disappointments owing to the unearthing of crude oil (Adeola, 2005). The Nigeria's Industrial sector received a major hurdle, due to the discovery of crude oil in 1956. The discovery of oil has led the nation to a shift in focus from her pre-eminent position of developing the industrial production base to overdependence on crude oil. The Nigeria's petroleum Industry is now the centre of attraction, while other key sectors like the Industrial sector and Agricultural sector, have been treated with laxity. This is better explained by the gross infrastructural decay as witnessed in the now extinct Ajaokuta steel company, the steel company in Aladja, Delta state, the epileptic nature of the textile industry in Kano state, the dead Textile Mill in Benin City, Edo State as well as the dead pyramids in the Northern parts of the country. Ogbu, (2012) however submitted that, despite the unfortunate situation enumerated above, activities in the Nigeria's petroleum industry do not transmit into

any form of agglomeration or industrial spill over effect.

Consequently, the sector is unable to attract the necessary investment for economic growth and remains a small player in the economy. In recent years, the sector’s share of GDP has remained less than 4 per cent, contributions to foreign exchange earnings have been minimal and the share of employment and government revenue generated has been low (Nigeria Industrial Revolution Plan, 2014). Adjudging from the 2013 statistical reports of the Central Bank of Nigeria, the Nigerian manufacturing sector contributed a share of about 4.8 per cent of her Gross Domestic Products (GDP) in 1960. This however rose to about 7.2 per cent in the year 1970. As of 1975, the Nigerian manufacturing sector accounted for about 7.4 per cent as a share of GDP, after which it dropped to about 5.4 per cent in 1980. As at 1985, the Nigerian manufacturing sector accounted for about 10.7 per cent as a share of GDP, after which it increased to about 8.1 per cent in 1990, but further dropped to about to 7.9 per cent in the year 1992 (CBN, 2013).

A tour to the Central Bank of Nigeria (2015) Statistical report further gives us a clear insight on how well the Nigeria manufacturing sector has performed over the years. For instance, between 1981 and 1991, the Nigeria’s Manufacturing Sector outputs alternated between N1018.91 billion and N1829.34 billion. It however rose to about N1918.09 billion and N3079.04 billion in 2003 and 2008 respectively. As of 2012, the figure as grown to about N4783.66 billion after which it attained it peak of about N6684.22 billion in 2014, but declined to about N6586.62 billion in 2015.

Industrial production as a percentage of GDP in Nigeria averaged 1.81 per cent between 2007 and 2015, reaching an all-time high of 20.10 per cent in the first quarter of 2011 and a low record of -6.60 per cent in the second quarter of 2015 (Trading Economics, 2016). This is however attributed to the prevalence of insurgencies in the country. Similarly, Central Bank of Nigeria (2013) reported that, industrial outputs in Nigeria rose slowly from N20.17 billion in 1980 to about N94.69 billion in 1987. It however rose from N126.13 billion in 1988 to about N16,032.28 billion in 2011 but dwindled to N13,319.13 billion in 2015 due to rising costs of operation, low consumer demand and harsh economic environment in Nigeria. The figure below tells the full story.

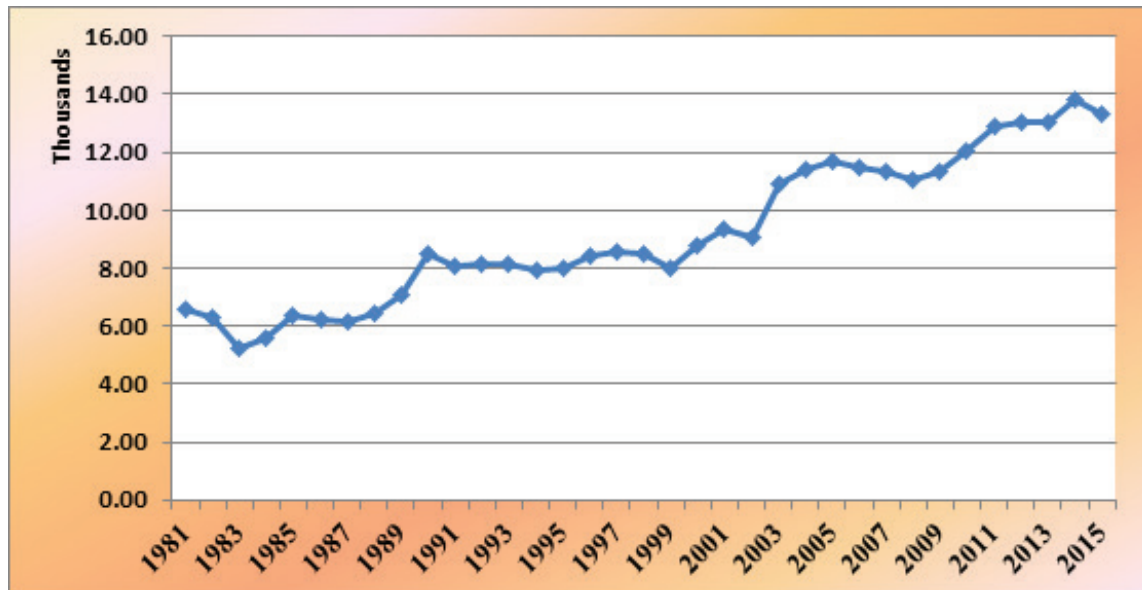


Figure 2.1: Industrial Sector Outputs in Nigeria (NBillion)

## Methodology and Model Specification

This segment covers the description of research design adopted in establishing the causal relationship between global oil prices and global energy consumption. These include theoretical framework, model specification, data collection technique as well as the data analysis procedure for this study.

### Theoretical Underpinnings

The theoretical framework of this study is predicated on the Tamuno and Edoumiekumo (2012) approaches employed in analysing the nexus between globalization and the Nigerian industrial sector. However, the modified Tamuno and Edoumiekumo (2012) industrial sector output model will be considered for this paper with the choice of Exchange Rate, foreign direct investment, industrial production (the dependent variable), interest rate, trade openness and real wage.

### Specification of Econometric Model

In view of some reviewed literature in addition to the theoretical basis of the study, causality issues are discussed by assessing the coefficients of the Error Correction Model obtainable as follows;

$$\begin{aligned} \cdot \partial \text{INDQ} = & \beta_0 + \eta_i \sum_{i=0}^k \cdot \partial \text{EXRT}_{t-i} + \psi_i \sum_{i=0}^i \cdot \partial \text{FDI}_{t-i} + \Upsilon_i \sum_{i=0}^m \cdot \partial \text{INTR}_{t-i} \\ & + \alpha_i \sum_{i=0}^n \cdot \partial \text{OPN}_{t-i} + \delta_i \sum_{i=0}^o \cdot \partial \text{RWAGE}_{t-i} - \pi \text{ECM}_{t-1} + \mu_t \dots \dots \dots 3.1 \end{aligned}$$

Where INDQ=Industrial Production, EXRT=Exchange Rate, FDI= Foreign Direct Investment, INTR=Interest Rate, RWAGE= Real Wage and OPN= Trade Openness, t=time, i=lag length, ECM= Error correction factor, that determines how fast industrial production adjusts to its long run convergence and  $\mu$ =stochastic disturbance term that captures all other variables not captured in the model but influence industrial production in one way or the other. The error-correction term however captures the extent of the reconciliation between the variables short run dynamics and their long term convergence.  $\beta_0$ =the intercept in the model,  $\eta_i$ ,  $\psi_i$ ,  $\Upsilon_i$ ,  $\delta_i$  and  $\alpha_i$  are the impacts measuring parameters of the respective variables captured in the model,  $\partial$  indicates the first difference of the respective variable which is given as  $X_t - X_{t-1}$ . Where  $X_t$  could be any variable and  $X_{t-1}$  is the lagged series under consideration.

## Methodology

This study adopts the method of co-integration and error correction mechanism (ECM) in the empirical analysis of the effect of Globalization on Industrial Production in the context of Nigeria. The series were subject to unit root tests, following Dickey and Fuller (1981) method. The test was also complemented using Phillip and Perron (1988) approach. The idea of using the Phillip-Perron test hinges on its robustness in the face of autocorrelation and time dependent heteroskedasticity. After that, the study considered co-integration test for possible linear combination of long term association amongst the variables under review, by adopting the Johansen rank test.

## Data Collection Technique

Annual time series data set was employed for this study for the period 1981-2015. The underlying data set was sourced from the World development indicators of the World Bank (2016) and the Central Bank of Nigeria (CBN, 2016) Annual accounts and various Issues.

## Discussion of Empirical Findings and their Policy Implications

In this segment, focus is on the presentation and analysis of results, in addition to the discussion of the various findings of the study as well as their implications for policies recommendations.

## Descriptive Statistics

The descriptive statistics of all the series under consideration are reported and discussed below. Precisely, the mean, skewness, maximum and minimum values, kurtosis, median, standard deviation, Jarque-Bera values along with their equivalent probability values are also stated in Table 4.1. The mean of each of the series is a pointer to the average of the corresponding variable as it is used in the study. The standard deviation shows how distributed the variable is from the mean. Additionally, the skewness and kurtosis indicators reveal the asymmetry and peakedness of the distribution while the normality test was conducted using the Jarque-Bera statistic.

From Table 4.1, all the variables were found to be platykurtic in their distribution and are positively skewed except interest rate and trade openness. However, it can be inferred from table 4.1 that, Exchange Rate, foreign direct investment, industrial production, interest rate, trade openness and real wage averaged (mean values) 70.83, 317.59, 36.78, 6.11, 52.24 and 58.03 respectively while their standard deviations were 65.16, 426.50, 8.32, 2.84, 15.82 and 55.34 in that order, during the estimation period. From the table also, The Jarque-Bera statistics and their corresponding probability values indicate that all variables (except FDI and real wage) are normally distributed. Table 4.1 reports the results as seen below.

**Table 4.1: Descriptive Statistics of Industrial Production and its Determinants**

Statistic	EXRT	FDI	INDQ	INTR	OPN	RWAGE
Mean	70.82762	317.5881	36.78102	6.105143	52.23697	58.02739
Median	22.07000	43.10000	36.75000	6.700000	55.85000	37.51000
Maximum	171.2068	1368.070	53.00000	11.06000	81.81000	167.1858
Minimum	0.620000	0.150000	22.07561	0.320000	23.61000	7.040000
Std. Dev.	65.16480	426.4988	8.315802	2.842342	15.81842	55.37464
Skewness	0.181600	1.111507	0.045830	-0.427321	-0.273514	0.958863
Kurtosis	1.252016	2.847095	2.023708	2.441119	2.180284	2.312879
Jarque-Bera	4.648236	7.240875	1.402257	1.520694	1.416296	6.051808
Probability	0.097870	0.026771	0.496025	0.467504	0.492556	0.048514
<b>Observations</b>	<b>35</b>	<b>35</b>	<b>35</b>	<b>35</b>	<b>35</b>	<b>35</b>

Source: Author's output Using E-Views 9

## Stationarity Test

Findings by Granger and Newbold (1977) reveals among other things that, most time series variables always trend in non-stationary forms. Thus, employing such variables is likely to produce regression outcomes that are spurious in nature. As a result, the Phillips-Perron (PP) test was used to complement the Augmented Dickey-Fuller (ADF) test, with a view to inspecting the stationarity position of the series employed for this empirical assessment. The Augmented Dickey-Fuller test minimises the Akaike information criterion (AIC) while the Phillips-Perron test centres on the Bartlett Kernel technique. In addition to that, the bandwidth is preferred on the basis of the Newey-West method as a result of its robustness in the face of time dependent heteroskedasticity and serial correlation. The outputs of the stationarity tests are available in Table 4.2 below.

**Table 4.2: Augmented Dickey Fuller and Philips Perron Unit Root Tests**

Variable	ADF test statistic	ADF Critical values	Remark	Phillips-Perron	PP critical values	Remark
EXRT	-5.48	3.65**	I(1)	-5.48	-3.65**	I(1)
FDI	7.05	-3.65**	I(1)	-7.05	-3.65**	I(1)
INDQ	-5.98	-3.65**	I(1)	-5.98	-3.65**	I(1)
INTR	-5.80	-3.65**	I(1)	-5.80	-3.65**	I(1)
OPN	-7.37	-3.65**	I(1)	-7.37	-3.65**	I(1)
RWAGE	-6.65	-3.65**	I(1)	-6.65	-3.65**	I(1)

NOTE: \*\*denote significance at 1%, \*denote significance at 5%,  
Source: Author's output Using E-Views 9

From the result above, both Augmented Dickey Fuller and Philips Perron Unit Root Tests results indicate that all the variables became stationary at first difference. On the other hand, all the series exhibit first order integration at 1per cent significance level. Next, we check if there is at least a linear combination of the series.

## Testing for Co-integration

Cointegration test is normally piloted to determine the presence (or otherwise) of long-term connexion between the series in the Regression model. This study therefore considers the methodology submitted by Johansen (1988) and Johansen and Juselius (1990). By adopting the technique provided by Johansen and Juselius (1990), the Trace statistics and the Maximum-Eigen values became imperative in evaluating the number of cointegrating relations. The outcome of the Johansen cointegration rank test is presented in Table 4.3. However, the test statistics reveals that the hypothesis of no cointegration can be overruled. On the other hand, Trace test reports the existence of four (4) cointegrating vectors at 5per cent significance level and three (3) cointegrating relations at 1per cent level of significance. In addition, Maximum-Eigen value test reveals the presence of one (1) cointegrating vector at both 5per cent and 1per cent significance levels. Adjudging from the submission by Pesaran, (1997), the inference is that, long term stability exists between the variables utilised for the study and this is fundamental in the area of policy analysis.



**Table 4.3: Johansen Cointegration Rank Test Outputs**

Null Hypothesis	Trace Statistics	Critical value at 5%	Critical value at 1%	Max-Eigen Statistics	Critical value at 5%	Critical value at 1%
$\gamma = 0$	167.6619**	114.90	124.75	55.15243**	43.97	49.51
$\gamma \leq 1$	112.5094**	87.31	96.58	33.70069	37.52	42.36
$\gamma \leq 2$	78.80876**	62.99	70.05	32.11502*	31.46	36.65
$\gamma \leq 3$	46.69374*	42.44	48.45	22.38962	25.54	30.34
$\gamma \leq 4$	24.30412	25.32	30.45	14.16940	18.96	23.65
$\gamma \leq 5$	10.13472	12.25	16.26	10.13472	12.25	16.26

Note:  $\gamma$  represents number cointegrating vectors

Source: Author's output Using E-Views 9

### Parsimonious Error Correction Mechanism

The main task of instituting the functional connection between Globalization and Industrial Production in Nigeria was accomplished using the Error correction modelling technique (ECM). Having established the stationarity and long run stability status of the variables employed in the study, we state a parsimonious error correction equation in order to address the short-run divergences which are likely to ensue in assessing the long-run cointegrating vectors. The parsimonious error correction model achieves this by presenting an error correction factor. In respect to this, the error correction factor allows us to gauge the extent of the adjustment of Industrial Production to its long-run convergence. Table 4.4 below reports the estimation output.

**Table 4.4: Parsimonious Error Correction Estimates**

Explained Variable:  $\hat{\theta}(\text{INDQ})$

Method: ARMA Conditional Least Squares (BFGS / Marquardt steps)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.03	0.53	-0.05	0.96
$\hat{\theta}(\text{EXRT})$	-0.12	0.04	-3.02	0.01***
$\hat{\theta}(\text{FDI})$	0.01	0.00	2.86	0.01***
$\hat{\theta}(\text{INTR})$	0.24	0.43	0.55	0.59
$\hat{\theta}(\text{OPN})$	0.27	0.05	5.81	0.00***
$\hat{\theta}(\text{RWAGE})$	0.02	0.03	0.64	0.53
ECM(-1)	-0.65	0.08	-8.30	0.00***
R-squared	0.66	Prob(F-statistic)		0.00
Adjusted R-squared	0.57	Akaike info criterion		6.09
Durbin-Watson stat	1.82	Schwarz criterion		6.46
F-statistic	6.78	Hannan-Quinn criter.		6.21

NB: \*\*\*Denotes Significance at 1%.

Source: Author's output Using E-Views 9

## Discussion of Findings

From the empirical result in Table 4.4 above, exchange rate deterioration (devaluation of the Naira) has a depressive influence on industrial sector outputs in Nigeria in the period under review. In addition, a unit decrease in the value of the Naira is accompanied by a corresponding decrease in industrial production by about N0.12billion. It therefore implies that, currency depreciation has done more harm than good to the Nigerian industrial sector over the years. In addition, interest rate (though, exhibited evidence of sign reversal) and real wage were found to be statistically insignificant in the period of estimation.

Also, foreign direct investment and trade openness exert positive and statistically significant (at 1percent significance level) impacts on industrial production in Nigeria and this is in line with our theoretical apriori expectation. This result further corroborates previous findings by Tamuno and Edoumiekumo, (2012). In a nutshell, the result depicts that, N1billion increase in foreign direct investment and trade openness will cause industrial production in Nigeria to rise by N0.01billion and N0.27 billion respectively. On the other hand, the more open a country's economy is to foreign economic engagements, the more expanded its industrial base will be and by extension, its industrial outputs will tend to grow faster.

Furthermore, the results from the error-correction model reveal that, about 65 percent of the short run shocks in industrial production is significantly (at 1percent significance level) corrected every 12 months. This is suggestive of a high rate of convergence of industrial production to its long term equilibrium. The coefficient of determination (R-squared) implies that, approximately 66 per cent of the aggregate shocks in industrial sector outputs is explained by the joint influence of all the explanatory variables (exchange rate, foreign direct investment, interest rate, trade openness and real wage) employed in the study. This further confirms that the model has a good fit. The F-statistic indicates that, the null hypothesis of joint insignificance can be discarded at 99per cent confidence level.

## Robustness Check

Some residual diagnostics tests were carried out in order to further strengthen the consistency and efficiency of the estimates reported above.

### Testing for Autocorrelation and Heteroskedasticity

The Breusch-Pagan-Godfrey Test was implemented for the detection of the presence (or otherwise) of Autocorrelation and Heteroskedasticity in the estimated model. Remarkably, both results shown that, neither Autocorrelation, nor Heteroskedasticity exists in our estimated results. The tests outcomes are distinctly presented as seen in Table 4.5A and Table 4.5B below.

**Table 4.5A: Breusch-Godfrey Serial Correlation L-M Test Results**

F-statistic	0.224452	Prob. F(2,22)	0.8008
Obs*R-squared	0.639896	Prob. Chi-Square(2)	0.7262

**Table 4.5B: Breusch-Pagan-Godfrey Heteroskedasticity Tests Results**

F-statistic	0.237828	Prob. F(6,25)	0.9598
Obs*R-squared	1.727895	Prob. Chi-Square(6)	0.9429
Scaled explained SS	1.345522	Prob. Chi-Square(6)	0.9691

Source: Author's output Using E-Views 9

## Policy Implications

From the estimated result above, it was found that, exchange rate, FDI and openness to trade, were found to be of huge significance as indicated by their respective t-ratios. The main inference that can be drawn here is that for a certain level of industrial output to be achieved in Nigeria, due attention must be given to these variables captured in the model. This implies that foreign direct Investment, exchange rate and trade openness are crucial variables to be considered when designing macroeconomic policies aimed at enhancing industrial growth and development.

The positive nature of the coefficient of trade openness indicates that, the more liberal the Nigerian industrial sector is to the international environment, the higher the propensity of the growth of industrial output in general. The result also showed that, FDI inflows in Nigeria is positively related to industrial sector outputs. This implies among other things that, the higher the inflows of FDI into key sectors, particularly those that promote the production of the needed primary products to boost the operation of the domestic production bases, the more developed the industrial sector will be. This creates positive externality(s) in the system through technological transfer and so on.

## Conclusion and Recommendations

This study set out to explore the causal relationship (if any), between globalisation and industrial production in the context of Nigeria, for the period 1981-2015, using Cointegration and error correction methodology. Results from the error-correction model reveal that, about 65 percent of the short run shocks in industrial production is significantly corrected every 12 months. This is suggestive of a high speed of adjustment of industrial production to its long term stability.

The study revealed a positive and statistically significant linkage between industrial production and foreign direct investment as well as openness to trade, while a negative linkage was found in the case of exchange rate and industrial production in Nigeria. The study therefore recommends as follows; given the positive and statistically significant effect of FDI inflows on the country's industrial sector outputs, efforts must be made by all strata of government within the country to put in place appropriate strategies that would promote investment-friendly environment aimed at attracting the right kind and quality of FDI into the industrial sector.

The Nigerian Government should build a strong institutional framework, mainly in the areas of induced investment and investor protection. Investors should be convinced of the efforts being made regarding tackling political instability, insecurity and uncertainty in the Nigerian industrial sector. Governments, both at the Federal and State levels should promote the production of goods that are intermediate in nature, through favourable industrial policies legislation that will translate into good incentives and investment-friendly environments. This is to boost investors' confidence, enhance the competitiveness of the Nigerian industrial sector, and mitigate the depressing effects of exchange rate depreciation as well as guaranteeing a move toward swift convergence between globalisation and industrial production.

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