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EXTERNAL SECTOR INDICATORS AND INDUSTRIAL SECTOR PERFORMANCE IN NIGERIA

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ABSTRACT

This study examined the relationship between external sector indicators and industrial sector performance in Nigeria. The study collected data from the Central Bank of Nigeria statistical bulletin. The study adopted the ordinary least squares (OLS) technique, such as the Augmented Dickey-Fuller (ADF) test, Johansen Cointegration test, and Error Correction Mechanism. The results revealed that foreign direct investment (FDI) inflow and trade openness (TOP), exchange rate (EXR), and net export (NEX) were not rightly signed. This implies that an increase in these variables affects the industrial sector negatively in Nigeria in the period under study. On the other hand, external reserves (ERS) and inflation rate (IFR) showed a positive relationship with the industrial sector in Nigeria. This is in line with theoretical a priori expectations. However, the failure of FDI, TOP, EXR, and NEX to improve the performance of the industrial sector may be attributed to unreliable data in Nigeria. The hypotheses tested proved that FDI and ERS have a significant impact on the industrial sector in Nigeria. But TOP, IFR, NEX, and EXR were not significantly related to industrial sector performance in Nigeria. Based on the findings, it was recommended, among other things, that the monetary authority should devote effort to building sustainable external reserves to a level that supports international liquidity and convertibility of the domestic currency and growth of the Nigerian industrial sector. There should be preferences in the foreign exchange allocation to the manufacturing subsector. A parallel exchange rate market would be advantageous to the industries.

Keywords: *External sector, Industrial sector, FDI, Trade openness, External reserves*

JEL Classification: C22, F21, F31, F41, L60, O14.

1. Introduction

The industrial sector remains the heartbeat of every successful economy. Ayeyemi (2013) notes that “it involves production of output in a large scale which simply opens up the economy and as a result, foreign investors are wooed into the economy and jobs are created which in the long run reduces the rate of unemployment to the lowest minimum and also increase the foreign earning of the country due to huge receipts from goods exported abroad”. In the words of Okuneye (2019), “this will in the long-run further open up the economy for advancement and also enhance industrial development”. However, it is important to note that all industries in Nigeria require inputs for the production of goods and/or services; most of these inputs are being imported from abroad. Therefore, the external sector is expected to affect the cost of inputs, overall level of output in the long run, as well as industrial sector performance.

According to Akidi et al (2018), the external sector is one of the most important sectors in economic growth and development processes of any economy, be it developed or developing. This is because the external sector is a network of economic transactions a country has with other countries. It reflects the economic transactions between the residents of an economy and the rest of the world. The optimal functioning of the external sector is important to the growth and stability of every economy. The external sector can either be in a state of stability or in a state of instability. A stable and balanced state of equilibrium occurs when receipts (inward payments) from activities in the sector are exactly enough and equal to out payments”. In line with the view of Akidi et al (2018), Obadan and Okojie (2010) pointed out thus: “without tapping into the world market through external sector, Nigeria’s relatively large domestic market can support growth but cannot on its own ensure sustainable growth at the rates needed to make visible impact on development of all sectors of the country”.

The major indicators of the external sector include: balance of payments (BOP), exchange rate, external debt, and exports. Other indicators are imports, foreign portfolio investment (FPI), and foreign direct investment (FDI). These indicators contribute in one way or the other to industrial sector performance in Nigeria.

In Nigeria, industrial sector performance seems poor in recent times. This is blamed on fluctuations in the external sector indicators such as exchange rate, external reserves, and trade, etc. It should be recalled that government efforts made to address this problem seem unimpressive. This has not only caused setbacks to the growth rate of industrial output, but it has also slowed down rapid economic growth and development of the economy of Nigeria. Additionally, the plethora of empirical studies (Akidi et al, 2018; Nelson & Wilberforce, 2018; Nwaeze, 2017; Omekwe et al, 2017) examine the effect of the external sector on economic growth. These studies did not link the external sector to industrial sector performance in Nigeria. This study therefore fills the gap as it examines the relationship between external sector indicators and industrial sector performance in Nigeria.

Research Questions

To achieve the objectives of the study, the following research questions were put forward to guide the study’s focus:

- a) What is the relationship between net export and industrial sector performance in Nigeria?

- b) How does foreign direct investment affect industrial sector performance in Nigeria?
- c) What is the relationship between external reserve and industrial sector performance in Nigeria?
- d) What is the relationship between trade openness and industrial sector performance in Nigeria?
- e) How does exchange rate affect industrial sector performance in Nigeria?

Objectives of the Study

The objectives of the study are to:

- a) Examine the relationship between net export and industrial sector performance in Nigeria;
- b) Ascertain how foreign direct investment affects industrial sector performance in Nigeria;
- c) Investigate the relationship between external reserve and industrial sector performance in Nigeria
- d) Determine the relationship between trade openness and industrial sector performance in Nigeria
- e) Assess how exchange rate affects industrial sector performance in Nigeria.

2. Literature Review

2.1 Conceptual Literature

Industrial Sector

According to Adejugbe (2004), “industrial sector is defined as the sector that processes raw materials and transforming it into finished goods with increasing application of science and technology”. He notes that “industrial activity is seen as the progressive ability of a people to harness human and material resources for the production of goods and services as a key component of economic development. This involves a modernization process through development of new technologies and production methods”.

The industrial sector has equally been described by Ayeyemi (2013) “as the heartbeat of every successful economy; this is because it involves production and manufacturing of output on a large scale which simply opens up the economy to the outside world. The industrial sector consists of the secondary production activities of the economy and includes sectors which are responsible for the production of goods which are either consumed in the country or exported to other countries”.

External Sector Indicators

According to Mordi et al (2010), “the external sector is the portion of a country's economy that interacts with the economies of other countries. In the goods market, the external sector involves exports and imports. In the financial market, it involves capital flows. Economic features related to the external sector include: balance of payments, current account, capital account, foreign direct investment, external debt, exchange rate, foreign-exchange reserves, and international investment position. Mordi et al (2010) further identified the major indicators of the external sector as “balance of payments (BOP), exchange rate, external debt, and export. Others are foreign exchange earnings, imports, foreign portfolio investment (FPI), and foreign direct investment (FDI). The indicators of the external sector considered in this study are: net export, foreign direct investment, external reserves, trade openness, and exchange rate.

2.2 Theoretical Literature

This study is hinged on the Two-Gap Model. The two-gap model was postulated by Harrod (1939) and Domar (1946). According to the model states, “most countries are underdeveloped either because they are faced with a shortage of domestic savings to augment for investment opportunity or they are faced with foreign exchange constraints to finance the needed capital and international goods”. The model therefore, introduces the assumption that an imported commodity not produced domestically is essential for the production of investment goods. In essence, the model states that “if the available domestic savings fall short of the level necessary to achieve the target rate of growth, a savings-investment gap is said to exist. And to close this gap requires Foreign Direct Investment (FDI); so also, if the maximum import requirement needed to achieve the growth target is greater than the maximum possible level of export, this is a situation of high importation which will lead to a shortfall in the foreign exchange. This creates the trade gap, which can be corrected by foreign aid. Despite the plausible contribution of this model, as observed by Abdullahi et al (2013), the model is not immune to some weaknesses, as it focuses exclusively on the savings-investment gap to achieve growth. By not considering the performance of the external sector of the borrower’s economy, the model is silent on this transformation problem, being a closed-economy growth model. The relevance of this theory to this study is that the model promotes domestic savings as a compulsion to achieving a target rate of growth. It also affirmed that the external sector plays a pivotal role in industrial development, economic growth, and/or the development trajectory of any given economy, as it could be used to bridge the domestic savings-investment gap through Foreign Direct Investment, foreign exchange, and foreign aid while maintaining external stability.

2.3 Empirical Literature

There is a plethora of empirical studies on the relationship between external sector and industrial sector performance. For instance, the work of Wosu and Lawrence (2024) examined the relationship between external sector variables, exchange rate, and industrial sector output performance in Nigeria from 1980-2023 using the Ordinary Least Squares analysis, the co-integration test, and error correction mechanism. The study revealed the existence of a positive relationship between foreign direct investment and foreign port investment, while a negative link exists between the exchange rate and industrial capacity utilization on the industrial sector output performance in Nigeria within the period under consideration, 1980-2023. The error correction coefficient ECM (-1) value is -0.804506 or 80 per cent and correctly signed (negative sign) and significant. This implies that external sector variables, exchange rate and industrial sector output performance in Nigeria adjust speedily to the changes in the explanatory variables. Therefore, the ECM can correct and tie any deviations from the long – run relationship between industrial sector output performance and the explanatory variables to the short-run period.

Also, the work of Emomotimi and Abraham (2024) investigated the effect of external sector performance on the development of the Nigerian economy. The study used performance indicators such as balance of payments, exchange rate, external reserves, foreign direct investment, and external debts for the period from 1981 to 2022. Secondary data were obtained from the Central Bank of Nigeria's statistical bulletin. Ordinary least squares (OLS) techniques such as the stationarity test and the autoregressive distributed lag (ARDL) bounds co-integration test were used in the analyses of data. It was revealed that an increase in the balance of payments, foreign direct investment inflows, and external debts increases gross domestic product per capita in Nigeria. In the short run, the balance of payments, foreign direct investment, external debts, and external reserves increased

gross domestic product per capita in Nigeria. The study recommended that the positive effect of the balance of payments should be sustained, actions should be taken to ensure that surplus revenues are invested in ventures that will grow and develop the economy, and the increase in Nigeria's external reserves should be sustained through deliberate efforts.

In a study conducted by Oladipo et al (2023), exchange rate fluctuations were regressed on manufacturing output in Nigeria using the Generalized Autoregressive Conditional Heteroscedasticity technique. The results of the model estimated revealed that there is no persistence of shocks in the volatility of the exchange rate in the Nigerian economy. The autoregressive distributed lag bounds test was used to establish the long-run relationship, which indicated that a long-run relationship exists between the exchange rate and manufacturing output. Also, the variance decomposition and Impulse Response function results revealed that exchange rate fluctuations have a negative impact on manufacturing gross domestic product in Nigeria. The study recommended that the monetary authorities constantly monitor the exchange rate fluctuations in order to create policies that are well-informed and match the exchange rate to the actual needs of the manufacturing sector in order to boost its output.

The work of Leera et al (2022) examined the effect of the Nigerian external sector environment on the performance of the Nigerian manufacturing sector between 1981 and 2019. The ex-post research design approach and the Autoregressive Distributed Lag (ARDL) model estimation techniques were considered. The model consists of the Nigerian manufacturing sector output index as the dependent variable and exchange rate, trade openness, and foreign direct investment as independent variables and external sector environment variables. Test of unit root results indicated that the variables have mix order of integration, while the co- integration analysis results indicated that the variables in the model have stable long run relationship. Estimates of the ARDL model reveals that in the short run exchange rate variations has negative, but significant effect on manufacturing sector performance, while trade openness and FDI have positive but insignificant influence on the manufacturing sector performance in the short run. In the long run, exchange rate level and FDI inflows have positive and significant effects on the manufacturing sector performance, while trade openness has a negative and significant effect on the Nigerian manufacturing sector performance. The study therefore concludes that the Nigerian external sector Environment has a significant influence on the performance of the Nigerian manufacturing sector.

The work of Nteegah and Olubiyi (2022) examined the effect of the external sector on the performance of the manufacturing sector in Nigeria. The study collected data on trade openness, foreign direct investment, foreign debt, exchange rate of the naira to the US dollar, and share of the manufacturing sector in GDP from the World Bank database. The study used regression analyses of the Parsimonious Vector Error Correction model (VECM) method. The result of the Johansen Cointegration Test showed that there exists a long-run relationship or cointegration between the external sector and the performance of the manufacturing sector in Nigeria. The result of the Parsimonious Vector Error Correction Model showed that trade openness and external debt have positive effects on the performance of the manufacturing sector in Nigeria, while foreign direct investment and exchange rate have negative effects on the performance of the manufacturing sector in Nigeria over the period investigated (1985 – 2020). The study recommended that a review of trade policy to favour domestic production, wooing of foreign investment, and proper utilisation of foreign borrowing were possible ways of improving the performance of the manufacturing sector and the Nigerian economy at large.

Emehelu (2021) conducted a study on the effects of international trade on economic growth in Nigeria from 1981–2018 using the ordinary least squares (OLS) technique. Findings from the study revealed that exchange rates in the country had a negative and insignificant relationship with GDP per capita. Consequently, the study recommends that since import and export trade have no significant effects on GDP per capita in Nigeria, the

federal government should embark on programs and policies to promote local production and discourage the importation of certain essential products for trade to have the desired impact on Nigeria's economy.

In the work of Giwa et al (2020), the effect of foreign direct investment (FDI) inflows into Nigeria on real gross domestic product (RGDP) growth was examined. The model constructed was estimated using the robust GMM estimation technique, which took care of the problem of endogeneity and autocorrelation inherent in ordinary least squares. The study found that labour quality has a positive and significant effect on RGDP in line with theory. Equally, it was found that capital intensity displayed a significant negative effect on RGDP in Nigeria. This study therefore recommended that policy makers in Nigeria should incorporate into their broad policy, improvement in capital intensity as a bedrock to growing the economy through FDI spillover effects.

In a study, Omoke and Opuala–Charles (2020) considered the nexus between trade openness and economic growth in Nigeria using institutional quality as an intervening variable. The study covered the period from 1984 to 2017 and employed three indicators of trade openness, including total trade, import trade, and export trade. The study adopted the ARDL bounds testing approach. The results provided evidence of a long-run relationship among the variables. It was shown that export trade has a significant positive impact on economic growth, while import trade indicated a negative and significant impact on economic growth. The results also showed that there was a negative long-run effect of import trade on economic growth in Nigeria, but it decreases as institutional quality (quality of governance) improves. The policy implications of these findings for Nigeria are that there is a need to improve the quality of governance in the country.

The work of Effiong et al (2019) enquired into the nexus between globalization, foreign direct investment and industrial sector performance in Nigeria. The study used econometric approaches such as unit root tests, co-integration test and error correction model to analyze the time series data from 1981 to 2017. Variables such as trade openness and current account balance were used to capture globalization, while portfolio investment was used to represent foreign investment inflows into the country. The findings revealed that FDI has a direct relationship with the Nigerian industrial sector, and globalization exerts a positive impact on industrial sector performance. The study recommended that there should be development of the manufacturing, mining and quarrying sub-sectors of the industrial sector, and reduce the overdependence on crude oil revenue, which has partly led to the neglect of these sub-sectors. Also, the need to protect indigenous infant industries by the government and the development of infrastructural facilities to reduce the problems of the industrial sector in Nigeria, etc.

In a study carried out by Sule (2019), external financing was regressed on industrial growth in Nigeria within the period of 1985-2018. Industrial Output (INDO), External Loans (EXL), Foreign Direct Investment (FDI), Remittances (RIMT), Gross Fixed Capital Formation (GFCF), Industrial Energy Consumption (IEC), and Contract Intensive Money (CIM) were used as variables in estimating the relationship. The study adopted an autoregressive distributed lag (ARDL) bound approach. It revealed that “a positive relationship exists between EXL and INDO while FDI and RIMT exert a negative effect on industrial growth”. It was recommended that public-private partnership is necessary to spur industrial sector activities with a strong institutional setup.

The work of Akidi et al (2018) examined the effects of selected external sector aggregates on economic growth in Nigeria from 1981 to 2016. The study used time series data on real gross domestic product as a proxy for economic growth. Imports, exports, exchange rate, and foreign direct investment as the external sector aggregates, which were collected from secondary sources. The study used both descriptive statistics and econometric methods of unit root test, co-integration test, and error correction model estimation. It was revealed that imports, exchange rate, and foreign direct investment indicated a negative association with economic

growth, while export showed a positive association with economic growth in Nigeria within the period of review. Apart from exchange rate, all the other explanatory variables were not statistically significant with economic growth in Nigeria within the period of study. It was recommended that the government should encourage diversification of the economy.

The study of Bamidele et al (2018) investigated the growth effects of the external sector in Nigeria. The study used the vector error correction model (VECM) to analyse the dynamic long-run and short-run estimates. The results show that the parameter of non-oil export was positive and significant at 10% in the long run, indicating that the contribution of non-oil export commodities to output growth is weak. However, the parameter was positive and significant in the short run at the conventional level. This implies that government policy should be directed towards increasing non-oil export commodities of agriculture, manufacturing and service industries to boost output growth in Nigeria.

The work of Nelson and Wilberforce (2018) examined the relationship between external reserve and economic growth in Nigeria from 1980 to 2016. The study used three explanatory variables (real gross domestic product, market capitalization, and agricultural output) and one explained variable (external reserve). Econometrics approach was adopted. It was revealed that there is a positive and significant relationship between external reserve and real gross domestic product in Nigeria. The study recommended that the government should implement policies that will promote the level of real gross domestic product in Nigeria.

In the study of the effects of exchange rate movements on the industrial growth in Nigeria, Akinmulegun and Falana (2018) while estimating with the time series data sparring from the period 1986 to 2015 adopted Johansen's co-integration model to explore the long-run relationship among the variables, and also used vector error correction model (VECM) to evaluate the short and long-run dynamic among the variables and the Granger Causality to measure contemporaneous relationship among the endogenous variables. The results indicate a unidirectional causality from the exchange rate to industrial output. The response of industrial output to the shock from the exchange rate was positive and significant. The study recommended the need for more macroeconomic policy attention to the proper management of the exchange rate, and the need to strengthen the link between agriculture and the industrial sector to reduce the reliance of the sector on imports of inputs to a reasonable level.

Nwaeze (2017) examined possible causal relationships between external sector variables and macroeconomic stability in Nigeria using the Autoregressive Distributed Lag (ARDL) approach to cointegration and error correction analysis over the period 1981 to 2016. First, the causal effect of external debt stock is positive and insignificant on economic growth and negative and insignificant on inflation in the long-run and short run. The result confirms the weakness of key external sector variables in driving economic activities in Nigeria and highlights the unique case of underutilized funds from abroad. Secondly, the causal effect of the exchange rate is found to be positive and significant in the long run and short run. Thirdly, the causal effect of FDI is found to be negative and insignificant on economic growth but exerts a positive and significant effect on inflation, suggesting the dominant role of FDI in driving macroeconomic stability in Nigeria. Finally, trade openness exerts a mixed causal effect on macroeconomic stability. This study concluded that external sector variables exert mixed causal effects on macroeconomic stability in Nigeria. This conclusion is premised on the results identifying real exchange rate and FDI among the underlying factors that determine the amount of economic activities and the rate of inflation passing through the Nigerian economy. The study recommended harmonization of the multiple exchange rate windows into a single window to enhance trade openness.

In the study of the relationship between external sector variables and economic growth in Nigeria, Omekwe et al (2017) used secondary data collected from the CBN statistical bulletin and adopted the fully modified least

squares (FMOLS) approach. The results showed a coefficient of determination of 98%. Implying that the regressors have high explanatory power; by extension, the estimated model is a good fit. Also, the coefficients of both external debt and export were positively signed and statistically significant with GDP at the 5% level. The coefficient of the exchange rate also has a positive relationship with GDP but is not significant at the 5% level. The study recommended that the government should maintain a good market-driven exchange rate policy in order to encourage local production and increase exports, which will increase economic growth.

In a study by Kanu et al (2017) on the contribution of FDI to industrial productivity in Nigeria, the econometric approach was adopted, and results show that FDI has a positive and significant relationship with mining sector productivity in Nigeria at the 5% Alpha level in the short run. This did not come as a surprise, seeing that the oil industry belongs to this sector. The impact of FDI is mostly restricted to the oil sector. It was recommended that the government should look inwards for productivity-enhancing attributes that could cater to our developmental needs, as no foreign nation will do it for us.

3. Methodology

Model Specification

Model specification is the determination of the endogenous and exogenous variables to be included in the model as well as the a priori expectation about the sign and size of the parameters of the function (Ibenta, 2012). In line with the above statement, this study adopts a multiple regression model. The model of this study is built on the work of Nwaeze (2017) in his analysis of the external sector variables and macroeconomic stability in Nigeria. The empirical model estimated in the study of Nwaeze (2017) was stated as follows:

$$GDP = \beta_0 + \beta_1 EXR + \beta_2 EXD + \beta_3 TRD + \beta_4 FDI + U \quad (3.1)$$

GDP = Gross domestic product per capita used as a proxy for Economic growth

EXR = Exchange rate

EXD = External debt

TRD = Trade openness

FDI = Foreign Direct Investment

U = Error Term

t = Time Frame

β_0 = Autonomous components of economic stability (RGDP and Inflation).

$\beta_1 - \beta_4$ = Coefficients of the independent variables

However, the model for the study is modified not only to incorporate the effect of external sector indicators on industrial sector performance in Nigeria, but also to remove variables that are not included in this study. Thus, the model is expressed as:

$$IIP = f(NEX, FDI, ERS, TOP, EXR, IFR) \quad (3.2)$$

Transforming equation (3.2) into a mathematical model, we have:

$$IIP = \beta_0 + \beta_1 NEX + \beta_2 FDI + \beta_3 ERS + \beta_4 TOP + \beta_5 EXR + \beta_6 IFR \quad (3.3)$$

Transforming equation (3.3) into an econometric model gives:

$$IIP = \beta_0 + \beta_1 NEX + \beta_2 FDI + \beta_3 ERS + \beta_4 TOP + \beta_5 EXR + \beta_6 IFR + \mu_t \quad (3.4)$$

$$\beta_1 > 0; \beta_2 > 0; \beta_3 > 0; \beta_4 > 0; \beta_5 < 0; \beta_6 < 0$$

Where:

IIP = Index for Industrial Production

NEX = Net export

FDI = Foreign direct investment

ERS = External reserve

TOP	=	Trade openness
EXR	=	Exchange rate
IFR	=	Inflation rate
f	=	function of
β_0	=	constant
$\beta_1 - \beta_6$	=	parameters

Variables of the Model

Dependent Variable

Index for Industrial Production (IIP)

This is an index that details the growth of the industrial sector in an economy. It is a composite indicator that measures the short-term changes in the volume of production of a basket of industrial products during a given period with respect to that in a chosen base period.

Independent Variables:

Net Export (NEX): This is a measure of Nigeria's total trade. It is measured as the value of a nation's total exports of goods and services minus the value of all the goods and services it imports. Net export is expected to have a positive relationship with the Index for Industrial Production.

Foreign Direct Investment (FDI): This is an investment in the form of a controlling ownership in a business in one country by an entity based in another country. Foreign direct investment is expected to have a positive relationship with the Index for Industrial Production. This is mathematically expressed as: $\beta_2 > 0$.

External Reserve (ERS): These are assets held by a Central Bank or other monetary authority, usually in various currencies, mostly the United States dollar, and to a lesser extent, the Euro, the Pound Sterling, the Japanese Yen, and used to back its liabilities. External reserve is expected to have a positive relationship with the Index for Industrial Production. This is mathematically expressed as: $\beta_3 > 0$.

Degree of Trade Openness (DTO)

This measures the extent to which a country is engaged in the global trading system. It is an economic metric calculated as the ratio of a country's total trade (the sum of exports plus imports) to the country's Gross Domestic Product. Degree of trade openness is expected to have a positive relationship with the Index for Industrial Production. This is mathematically expressed as: $\beta_4 > 0$.

Exchange Rate (EXR)

This is the price at which the currency of one country is exchanged for another country's currency. The exchange rate is expected to have a negative relationship with the Index for Industrial Production. This is mathematically expressed as: $\beta_5 < 0$.

Inflation Rate (IFR)

This is the rate at which prices increase over time, resulting in a fall in the purchasing value of money. The inflation rate is expected to have a negative relationship with the Index for Industrial Production. This is mathematically expressed as: $\beta_6 < 0$.

Estimation Procedure

This study obtained data from secondary sources such as journals, books, conference papers, the Central Bank of Nigeria's (CBN) statistical bulletin, National Bureau of Statistics (NBS), World Bank publications, among others. The stationary attributes of the time series data need to be verified by the adoption of unit root tests in order to avoid spurious estimates. The Augmented Dickey-Fuller (ADF) unit root test was used to test for the stationarity of the time series data used for the study. The result of the unit root test suggested the use of the Johanson cointegration test and error correction mechanism. The study used EViews 10.0 to facilitate the estimation processes.

4. RESULTS AND DISCUSSION OF FINDINGS

Presentation of Results

Unit Root Analysis

The Augmented Dickey-Fuller (ADF) unit root test was used to establish the stationarity of the time series data used in this study. The results of the ADF unit root test are in Table 1 as follows:

Table 1: ADF Unit Root Test

Variables	ADF Stat. at Levels	1% Crit. Value	5% Crit. Value	ADF Stat. at first Diff.	1% Crit. Value	5% Crit. Value	Order of integration
Log(IIP)	-0.006009	-3.615588	-2.941145	-5.559503*	-3.621023	-2.943427	I(1)
Log(NEX)	1.523472	-3.615588	-2.941145	-5.540038*	-3.641672	-2.943427	I(1)
IFR	-0.073474	-3.615588	-2.941145	-4.314992*	-3.621023	-2.943427	I(1)
Log(FDI)	-1.458263	-3.615588	-2.941145	-7.426567*	-3.641066	-2.943427	I(1)
DTO	-2.426328	-3.615588	-2.941145	-7.890828*	-3.647120	-2.943427	I(1)
EXR	2.534177	-3.615588	-2.941145	-4.354883*	-3.641672	-2.943427	I(1)
Log(ERS)	-1.793878	-3.615588	-2.941145	-5.228842*	-3.641672	-2.943427	I(1)

Source: Computed from E-view

Note: *() indicates (1%) and (5%) Significant Levels**

The unit root test in Table 1 above shows that all the variables are stationary at first difference [that is, $I(1)$] at 1% significance level. Therefore, the time series data used in this study were stationary.

Johansen Cointegration Test

To ascertain whether a long-run equilibrium relationship exists between the dependent and explanatory variables in the various models, the Johansen cointegration test was carried out. The result is in Table 2.

Table 2: Johansen Cointegration Test on the Model

Series: LOG(IIP) LOG(FDI) LOG(ERS) TOP EXR LOG(NEX) IFR

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.893682	151.1248	95.75366	0.0000
At most 1	0.642683	68.19600	69.81889	0.0669
At most 2	0.315710	30.11812	47.85613	0.7129
At most 3	0.258950	16.08131	29.79707	0.7065
At most 4	0.125899	4.992901	15.49471	0.8096
At most 5	0.000384	0.014205	3.841466	0.9050

Trace test indicates 1 cointegrating eqn(s) 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 Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.893682	82.92875	40.07757	0.0000
At most 1 *	0.642683	38.07788	33.87687	0.0148
At most 2	0.315710	14.03682	27.58434	0.8201
At most 3	0.258950	11.08841	21.13162	0.6385
At most 4	0.125899	4.978696	14.26460	0.7445
At most 5	0.000384	0.014205	3.841466	0.9050

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

From the result in Table 4.2, trace and max-eigen statistics indicate 1 and 2 cointegrating equations, respectively. This means that a long-run equilibrium relationship exists between the dependent and explanatory variables in the model.

Error Correction Mechanism Model

To adjust for the short run, the ECM model that established a relationship between the external sector and the industrial sector performance in Nigeria was estimated as follows:

Table 3: Parsimonious ECM Estimates on the Model

Dependent Variable: LOG(IIP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.230641	0.412755	-10.24977	0.0000
LOG(FDI)	-0.303362	0.101745	-2.981591	0.0410
LOG(FDI(-1))	0.150607	0.144808	1.040045	0.3101
IFR	0.079320	0.119681	0.662761	0.5147
IFR(-2)	0.178506	0.052913	3.475449	0.0127
LOG(ERS)	0.169532	0.051362	3.300741	0.0034
LOG(ERS(-3))	0.039094	0.054766	0.713839	0.4832
TOP	-0.004574	0.003206	-1.426515	0.1684
TOP(-1)	0.016622	0.003829	4.341159	0.0003
NEX	-3.80E-06	2.96E-06	-1.284494	0.2130
NEX(-1)	1.76E-06	3.27E-06	0.537274	0.5967
NEX(-3)	3.83E-06	2.01E-06	1.903109	0.0708
EXR	-0.001758	0.001618	-1.086747	0.2895
EXR(-1)	0.006589	0.002217	2.971650	0.0073
ECM(-1)	-0.898684	0.134171	-6.698026	0.0000
R-squared	0.917918	Mean dependent var	1.855744	
Adjusted R-squared	0.826530	S.D. dependent var	1.912567	
S.E. of regression	0.112661	Akaike info criterion	-1.234533	
Sum squared resid	0.266542	Schwarz criterion	-0.574733	
Log likelihood	37.22159	Hannan-Quinn criter.	-1.004245	
F-statistic	718.9890	Durbin-Watson stat	1.872377	
Prob(F-statistic)	0.000000			

Source: EViews Output, 2026

From the results in Table 3, Adjusted R^2 is 0.826530. This means that about 82% of the variation in the dependent variable is as a result of the variations in the explanatory variables. The remaining 8% may be attributed to the variables that are not included in the model. The F-statistic of 718.9890 indicates that the overall model is statistically significant at the 5 percent level. The result of the DW-statistic of 1.872377 shows no autocorrelation of the error term in the ECM. This means that the estimates based on OLS are not spurious. The value of the ECM of -0.898684 indicates an 89% speed of adjustment to short-run dynamics. The a priori expectations show that inflow of foreign direct investment (FDI) and trade openness (TOP), exchange rate (EXR), and net export (NEX) were not rightly signed. This implies that an increase in these variables affects the performance of the industrial sector negatively in Nigeria in the period under study. On the other hand, external reserves (ERS) and inflation rate (IFR) showed a positive relationship with the industrial sector in Nigeria. This is in line with theoretical a priori expectations. However, the failure of FDI, TOP, EXR, and NEX to improve the performance of the industrial sector may be attributed to unreliable data in Nigeria.

Table 4: Model Diagnostic Test Results

Diagnostic Tests for the Model	F- test Results	Prob.	Decision
Ramsey RESET Test	0.036681	0.8529	Accept
Normality Test (Jarque-Bera)	0.097001	0.9527	Accept
Heteroskedasticity (Glejser Test)	2.852912	0.0526	Accept
Breusch-Godfrey LM Test	1.377603	0.2265	Accept

Source: Computed from E-view 10.0

The various F-Statistic results in Table 4 revealed that the Error term is normally distributed with a zero mean, there is Homoscedasticity (implying that the variance of the error term is constant irrespective of the period), no serial dependence of the error term, and the model is correctly specified. Therefore, the null hypotheses of normality, constant variance of the error term, serial independence, and functional form of the model were accepted. That is, the model estimated has an error term that is normally distributed with a constant variance, and the error terms are serially independent. The Ramsey regression specification error test (RESET) statistic shows that the model is correctly specified (Gujarati, 2013).

Stability Tests

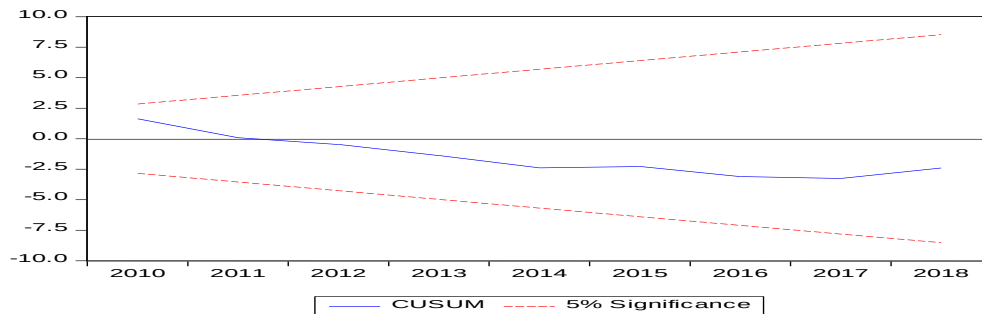


Figure 1: Cumulative Sum for the Model

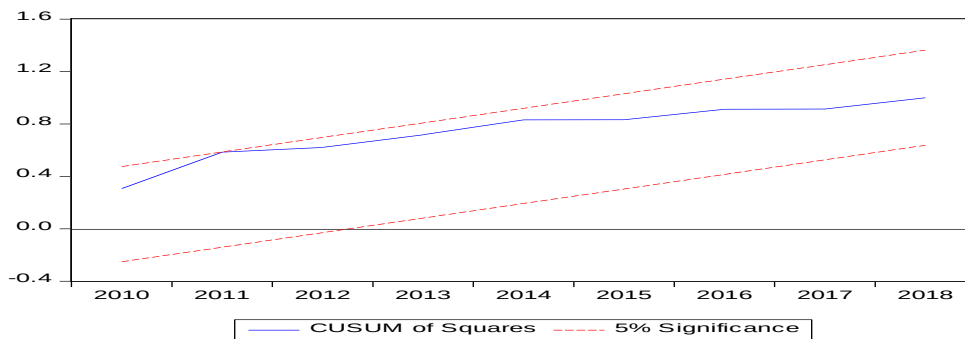


Figure 2: Cumulative Sum Square for the Model

4.2 Discussion of Findings

This study examined the relationship between the external sector and the industrial sector performance in Nigeria. From the results of the analysis of the regression in the model, it was revealed that inflow of foreign direct investment (FDI), trade openness (TOP), exchange rate (EXR), and net export (NEX) were not rightly signed. This implies that an increase in these variables affects the industrial sector negatively in Nigeria in the period under study. On the other hand, external reserves (ERS) and inflation rate (IFR) showed a positive relationship with the industrial sector being positively in Nigeria. This is in line with theoretical a priori expectations. However, the failure of FDI, TOP, EXR and NEX to improve the performance of the industrial sector may be attributed to unreliable statistical data in Nigeria. The hypotheses tested proved that FDI and ERS have a significant impact on the industrial sector in Nigeria. But TOP, IFR, NEX, and EXR were not significantly related to industrial sector performance in Nigeria.

This confirms the earlier study of Sule (2019), which established a negative relationship between FDI and industrial growth in Nigeria. Also, the finding lends credence to the work of Wosu and Lawrence (2024), which found a positive association between exchange rate and industrial output in Nigeria. But it is not consistent with their findings of a positive association between FDI, FPI, and industrial output in Nigeria.

The finding is also not in line with the earlier results of Kalu et al (2017) and Effiong et al (2019), which established a positive relationship between FDI and industrial sector performance in Nigeria. As well as Akumulegum and Falana (2028), who found a positive association between exchange rate and industrial output in Nigeria.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The results from the study have revealed that the external sector indicators of FDI and ERS have a significant impact on the industrial sector. It therefore implies that growing the Nigerian industrial sector requires a policy thrust that would lead to stability of the external sector indicators. Efforts to develop the economy through industrialization must address the instability in the external sector indicators within the context of policy instruments in the hands of the economic managers.

5.2 Recommendations

Based on the findings and conclusions from the study, we made the following recommendations for policy actions.

- a) The monetary authority should devote effort to building sustainable external reserves to the level that supports international liquidity and convertibility of the domestic currency and growth of the Nigerian industrial sector.
- b) Preference, in the allocation of foreign exchange, should be given to the manufacturing sector and industries that are negatively affected by the exchange rate level and instability, especially the chemical and pharmaceutical, and textile, apparel, and footwear industries. A parallel exchange rate market would be advantageous to these industries.
- c) Trade openness policies should be strategic to protect critical industries such as the textile, apparel, and footwear, chemical and pharmaceutical, and food, beverage, and electrical /electronic, and also to protect infant industries. This is necessary to protect the industries, jobs, self-reliance, and industrialization.
- d) Foreign direct investment should be directed to the industries where they have high linkage and positive spillover effects in both the long run and the short run.
- e) Economic policies should be directed at reducing the unfavourable balance of payment, which has negative effects on the manufacturing sector.

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