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EFFECT OF FISCAL POLICY VARIABLES ON NON-OIL INDUSTRIAL SECTOR OUTPUT IN NIGERIA

IDACHABA, Opaluwa. PhD.[1] & Muhammad I, Mainoma[2]
[1]*Jewel University, Gombe.*
baba.idachaba@outlook.com
[2]*Department of Accounting, Nasarawa State University, Keffi.*
iliyasumainoma001@gmail.com

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ABSTRACT

This study examined the effect of fiscal policy variables on Nigeria's non-oil industrial sector output from 1990 to 2024 using the Vector Error Correction Model (VECM). The research analyzed the impact of government capital expenditure, government revenue, domestic debt, and external debt on non-oil industrial output. Long-run VECM estimates reveal that government capital expenditure (-0.4115) and domestic debt (-0.8678) exhibit statistically significant negative coefficients, while external debt (0.1227) shows a statistically significant positive coefficient. Government revenue (0.0825) demonstrates a weakly significant positive relationship. The study concludes based on these estimated relationships that current patterns of capital expenditure and domestic borrowing are associated with lower non-oil industrial output, while external debt is associated with higher output. Recommendations include reforming capital expenditure implementation to address its negative association, reducing domestic borrowing levels, maintaining external borrowing with strengthened utilization frameworks, and addressing revenue mobilization weaknesses to potentially enhance its modest positive effect.

Keywords: Government expenditure, Government Revenue, Non-oil output, Public debt

Introduction

Fiscal policy is to the deliberate use of government revenue generation, public expenditure, and public borrowing to influence the level of economic activity in order to achieve macroeconomic objectives such as employment creation, price stability, income redistribution, and sustainable economic growth. Unlike monetary policy, which is implemented by the central bank and focuses on regulating the money supply, interest rates, and credit conditions, fiscal policy is implemented through the government's budgetary framework. Through taxation, public spending, and debt management, governments attempt to stimulate production, expand employment opportunities, and support structural transformation within the economy. Rooted in Keynesian economic principles, modern fiscal policy emphasizes the strategic use of government expenditure and borrowing to stabilize economic fluctuations and stimulate aggregate demand, particularly during periods of economic downturn.

In developing economies such as Nigeria, fiscal policy plays a critical role in promoting economic growth and structural transformation. Government revenue mobilization, capital expenditure, and public borrowing are often deployed to stimulate productive activities, provide infrastructure, and support industrial development. Fiscal policy tools are also expected to promote economic growth, reduce poverty, stabilize prices, and improve the balance of payments position of the economy (Okorie, 2017). According to the Central Bank of Nigeria, government fiscal operations influence the overall performance of key productive sectors by determining the level of investment in infrastructure, industrial development, and public services necessary for economic expansion.

This study focuses specifically on the non-oil industrial sector of the Nigerian economy. To avoid conceptual ambiguity, the non-oil industrial sector refers to industrial activities excluding crude petroleum and natural gas production. In line with the classification adopted by the National Bureau of Statistics, the industrial sector generally comprises manufacturing, mining and quarrying, construction, and utilities such as electricity and water supply. However, when petroleum and gas activities are excluded, the resulting segment constitutes the non-oil industrial sector, which is largely dominated by manufacturing and other industrial production activities outside the petroleum industry. It is important to maintain this distinction because the broader non-oil sector includes agriculture, services, trade, finance, and information technology, which are conceptually different from industrial production activities.

Despite the importance of the non-oil industrial sector in promoting economic diversification and employment generation, its performance in Nigeria has remained relatively weak. Data from the National Bureau of Statistics show that although the non-oil sector contributes over 90 percent of Nigeria's Gross Domestic Product, the industrial component of this sector particularly manufacturing has recorded relatively low growth. For instance, the non-oil sector contributed about 95.30 percent of GDP in the fourth quarter of 2023 and 93.62 percent in the first quarter of 2024 (NBS, 2024). However, manufacturing's contribution to GDP has remained modest. Historical evidence shows that while manufacturing accounted for about 11 percent of GDP during the 1973-1981 oil boom period, its contribution declined significantly over time and fell below 6 percent by 2022. In addition, manufacturing exports accounted for only 0.5 percent of total exports, while imports of manufactured goods represented more than 15 percent of GDP (Uffie & Aghanenu, 2019). These trends reflect structural weaknesses in Nigeria's industrial base and increasing dependence on imported manufactured goods.

Several factors have contributed to the stagnation of the non-oil industrial sector. These include poor infrastructure, unreliable electricity supply, high production costs, inadequate

technological capabilities, and weak industrial linkages. Studies such as Singh and Mehta (2021) emphasize that many manufacturing firms including those in textiles, tyre manufacturing, footwear, and battery production have collapsed due to rising production costs and limited access to modern technology. Similarly, Oluwaseun and Bamidele (2021) note that regulatory inconsistencies, multiple taxation, and weak policy implementation have further constrained industrial expansion in Nigeria.

Beyond these structural challenges, the composition and effectiveness of fiscal policy instruments also play an important role in shaping industrial performance. In principle, government capital expenditure should stimulate industrial growth by providing essential infrastructure such as roads, electricity, and industrial facilities that reduce production costs and improve productivity. Government revenue mobilization determines the availability of financial resources required to finance such developmental expenditures, while public borrowing through domestic and external debt provides additional funding when revenue generation is insufficient. However, Nigeria's fiscal structure has historically been characterized by revenue volatility, increasing public debt, and an expenditure pattern heavily skewed toward recurrent spending rather than productive capital investment (CBN, 2015).

Consequently, the major challenge confronting Nigeria's industrial development lies not only in the availability of fiscal policy instruments but also in the efficiency of their allocation and utilization. High levels of public borrowing may create concerns about debt sustainability and potential debt overhang effects, while unstable government revenues largely influenced by fluctuations in oil prices can weaken fiscal planning and development investment. At the same time, insufficient capital expenditure on infrastructure limits the productive capacity of domestic industries and discourages private sector investment.

Therefore, the stagnation of the non-oil industrial sector may be partly linked to the structure and management of fiscal policy in Nigeria. Inefficient allocation of public expenditure, unstable revenue generation, and rising domestic and external debt may constrain the ability of government fiscal interventions to stimulate industrial productivity. This creates the need for a systematic empirical investigation into how fiscal policy components influence the performance of the non-oil industrial sector.

In view of this concern, this study examines the effect of selected fiscal policy variables specifically government capital expenditure, government revenue, domestic debt, and external debt on non-oil industrial sector output in Nigeria. By analyzing the relationship between these fiscal variables and industrial performance, the study aims to provide empirical evidence that can guide policy formulation toward strengthening Nigeria's industrial base, promoting economic diversification, and reducing dependence on the oil sector.

The following null hypotheses were stated to achieve the objectives of the study;

H_{01}: government expenditure has no significant effect on non-oil industrial sector output in Nigeria
H_{02}: government revenue has no significant effect on non-oil industrial sector output in Nigeria
H_{03}: public domestic debt has no significant effect on non-oil industrial sector output in Nigeria
H_{04}: public external debt has no significant effect on non-oil industrial sector output in Nigeria.

Conceptual Review

Non-Oil Industrial Sector Output

Industrial output refers to the value of goods produced within the industrial segment of an economy through activities that transform raw materials into intermediate or finished products. In national income accounting, the industrial sector is distinct from the services sector and primarily includes manufacturing, mining and quarrying, construction, and utilities such as

electricity and water supply, as recognized by the National Bureau of Statistics. Within this classification, the non-oil industrial sector refers to industrial production activities excluding crude petroleum and natural gas extraction. It therefore captures industrial activities such as manufacturing production, solid minerals extraction, construction activities, and utilities that operate outside the petroleum industry.

Industrial output is often divided into manufacturing and non-manufacturing industrial output (Muhamad & Henny, 2020). Manufacturing output refers to the total volume or value of goods produced by firms engaged in transforming raw materials into finished or semi-finished products within a given period (Uffie & Aghanenu, 2019). These products may include textiles, machinery, electronics, processed foods, automobiles, and other factory-produced goods that contribute to industrial value added (Imide, 2019).

Non-manufacturing industrial output, on the other hand, refers to production generated from other industrial activities such as mining and quarrying excluding petroleum, construction activities, and utilities like electricity and water supply (Eze et al., 2019). These activities differ from services because they involve physical production and infrastructure development rather than intangible service delivery. Thus, in this study, non-oil industrial sector output refers to the combined value of industrial activities outside the petroleum sector, particularly manufacturing and other related industrial production that contribute to Nigeria's industrial development.

Fiscal Policy Variables

Fiscal policy refers to government actions involving revenue generation, public expenditure, and borrowing aimed at influencing macroeconomic performance. Traditionally, fiscal policy has been associated with the use of taxation and government spending to regulate economic activity and stabilize the economy (Agu et al., 2015). Through the budgetary process, governments allocate resources across sectors and determine the scale and direction of economic interventions. As noted by Omitogun and Ayinla (2017), fiscal policy serves not only as a financial plan for revenue and expenditure but also as an important instrument for managing national economic performance. Classical and Keynesian perspectives both recognize the stabilizing role of fiscal policy, although Keynesian economists emphasize expansionary spending during economic downturns to stimulate demand and employment (Dornbusch & Fischer, 2018).

In developing economies such as Nigeria, fiscal policy plays an important role in promoting economic development and sectoral growth. Government spending on infrastructure, education, and industrial development can improve productivity and stimulate private investment. However, scholars argue that the effectiveness of fiscal policy depends largely on the composition and management of fiscal instruments such as government expenditure, revenue generation, and public debt. These fiscal components therefore represent important variables for analyzing how government interventions influence productive sectors such as the non-oil industrial sector.

Government Expenditure

Government expenditure refers to the total spending by the government on the provision of public goods, infrastructure, and administrative services. Eze et al. (2019) describe government expenditure as financial outlays undertaken by the government to provide social and economic services necessary for national development. Scholars often distinguish between recurrent expenditure, which covers administrative and operational costs, and capital expenditure, which finances infrastructure and long-term development projects. Adegboyo et al. (2021) argue that the economic impact of government expenditure depends not only on its size but

also on its allocation across sectors. For instance, increased capital expenditure on infrastructure can reduce production costs and improve industrial productivity, while excessive recurrent expenditure may limit funds available for development-oriented investments. Consequently, many empirical studies emphasize the importance of government capital expenditure as a fiscal instrument capable of stimulating industrial development and economic growth.

Government Revenue

Government revenue represents the total income generated by the government to finance its expenditures and development programs. Okoroafor and Nwaeze (2013) define public revenue as funds generated through taxation, returns on government investments, and other non-tax sources such as fees and charges. Similarly, Musa and Sanusi (2013) note that government revenue constitutes the financial resources available to federal, state, and local governments for the execution of public policies and development projects. Scholars highlight that the stability and adequacy of government revenue significantly influence fiscal sustainability and public investment. In countries where revenue generation is volatile or heavily dependent on a single source, fiscal planning and development expenditure may become unstable. This is particularly relevant in Nigeria, where government revenue has historically relied heavily on oil-related income, thereby exposing public finances to fluctuations in global oil prices.

Public Domestic Debt

Public domestic debt refers to government borrowing obtained within the domestic financial system. Ndugbu et al. (2024) define domestic debt as the total outstanding government obligations issued to residents, financial institutions, and other domestic investors. These obligations are typically issued in the form of treasury bills, government bonds, and other debt instruments. Domestic borrowing can support government spending by providing additional financial resources when revenue is insufficient. However, scholars debate its broader economic effects. While moderate domestic borrowing can support economic development by financing productive investment, excessive borrowing may increase interest rates and crowd out private sector investment. Consequently, domestic debt is often examined as an important fiscal variable influencing economic performance and sectoral output.

Public External Debt

External debt refers to the total financial obligations owed by a country to foreign creditors, including international financial institutions, foreign governments, and private lenders (Onyele & Nwadike, 2021). According to Ama et al. (2024), external borrowing often arises when domestic savings are insufficient to finance investment and development needs. Access to foreign capital may enable governments to finance infrastructure projects, industrial development, and technological advancement. However, scholars also caution that excessive external debt can lead to debt servicing pressures, exchange rate vulnerabilities, and fiscal instability. If not effectively managed, rising external debt obligations may divert government resources away from productive investment toward debt repayment.

Empirical Review

Adesina and Olanrewaju (2024) investigated the impact of government expenditure on the non-oil industrial sector in Nigeria using data from 2010 to 2023. Employing the Autoregressive Distributed Lag (ARDL) bounds testing approach, the study reported a positive long-run relationship between public industrial spending and industrial output, with research and development expenditures exerting a significant positive influence. Technology investment also showed a positive but smaller effect on industrial output. While the study demonstrates the importance of government spending in promoting industrial growth, its

relatively short time horizon may limit the ability to capture long-term fiscal dynamics within the Nigerian economy. Similarly, Patel and Kumar (2023) examined the impact of government expenditure on industrial development in the non-oil sector of India using data from 2005 to 2021. The authors applied econometric techniques to analyze the effects of public investment expenditure, public sector expenditure, and transfer payments on the industrial production index. Their findings indicated that public investment expenditure had the strongest positive influence on industrial development, while public sector expenditure had a smaller but still significant effect. Although this study provides useful insights into fiscal expenditure and industrial growth, differences in institutional structures, fiscal frameworks, and economic conditions between India and Nigeria limit the direct applicability of these findings to the Nigerian context.

Other studies have focused on the revenue dimension of fiscal policy. Oke and Adetola (2024) examined the relationship between government revenue generation and the performance of the non-oil industrial sector in Nigeria between 2000 and 2023. Using time series analysis, the study found that corporate income tax and value-added tax had significant positive effects on non-oil industrial GDP, while internally generated revenue showed a moderate contribution. Similarly, Adeyemi and Okoro (2024) investigated government revenue strategies and industrial development using the ARDL approach with data spanning 2010 to 2023. Their findings revealed that value-added tax and internally generated revenue positively influenced manufacturing value added, although petroleum profit tax showed a weaker effect due to the dominance of oil revenue in Nigeria's fiscal structure. While both studies provide evidence on the importance of revenue mobilization for industrial development, they mainly focus on taxation variables and do not incorporate the role of government borrowing in shaping industrial sector performance.

A broader perspective is provided by Joshua-Gyang (2024), who examined the effect of fiscal policy on manufacturing sector output in Nigeria from 1987 to 2022 using the ARDL estimation technique. The findings revealed mixed effects of fiscal instruments on manufacturing output: government capital expenditure, oil taxation, and external debt were found to exert negative effects, whereas recurrent expenditure, non-oil taxation, and domestic debt showed positive relationships with manufacturing output. Although this study incorporated multiple fiscal indicators, it concentrated primarily on the manufacturing sub-sector rather than the broader non-oil industrial sector.

Furthermore, Ibrahim et al. (2024) analyzed the impact of external debt shocks on the real sector of Nigeria's economy between 1986 and 2020 using a Structural Vector Autoregression (SVAR) framework. Their results indicated that external debt shocks had negative effects on real sector performance, particularly agricultural output. While this study provides important insights into the macroeconomic implications of public debt, its focus on agriculture and debt shocks limits its applicability to industrial sector dynamics.

Theoretical Framework

Keynesian Economic Theory

The theory underpinning this study is the Keynesian economic theory, proposed by John Maynard Keynes, emphasizes the role of government intervention in stabilizing economic activity and fostering growth, particularly through fiscal policies. This framework is highly relevant to understanding the impact of fiscal policy indicators such as government expenditure, taxation, and public debt on the non-oil industrial sector. Keynesian theory argues that during periods of economic stagnation or underdevelopment, fiscal stimulus through increased government spending and reduced taxes can boost aggregate demand, thereby encouraging industrial output (Keynes, 1936). The general Keynesian model of aggregate demand (AD) is

expressed as:

$$AD = C + I + G + (X - M)$$

Where C represents consumption, I investment, G government spending, and (X−M) net exports. For non-oil industrialization, G plays a critical role in financing infrastructure and incentivizing industrial activities.

In the context of non-oil industrialization, fiscal policy influences industrial growth directly through public investment and indirectly through tax incentives and subsidies. For example, government expenditure on industrial parks, research and development, and transportation infrastructure can reduce production costs for industries. Keynesian theory suggests that a fiscal multiplier (k) magnifies the impact of government spending on aggregate output. The multiplier is expressed as:

$$k = \frac{1}{1 - MPC}$$

Where MPC is the marginal propensity to consume. A higher MPC implies a greater multiplier effect, leading to increased industrial output in the non-oil sector. Empirical studies have shown that targeted fiscal spending on industrial projects often results in significant growth in non-oil sectors (Blinder, 2006). Taxation policies also play a pivotal role in the Keynesian framework by influencing disposable income and investment. Reducing corporate tax rates can encourage private sector participation in the non-oil industrial sector. Additionally, introducing tax incentives for small and medium enterprises (SMEs) fosters innovation and productivity. The relationship between taxes (T) and disposable income (Yd) is given as:

$$Yd = Y - T$$

where Y represents total income. An increase in Yd stimulates consumption and investment, crucial for industrialization. However, excessive taxation can deter private investment, underscoring the need for a balanced fiscal approach (Oloyede, 2014). Debt-financed government expenditure is another fiscal policy tool supported by Keynesian theory, particularly in economies with limited revenue streams. By borrowing to invest in industrial infrastructure, governments can stimulate long-term growth in the non-oil sector. However, Keynesian theory warns against excessive public debt, which may crowd out private investment by raising interest rates. The relationship between government borrowing (B), interest rates (i), and investment (I) can be represented as:

$$I = f(i)$$

Where I decrease as i increases. Effective debt management is thus crucial for sustaining industrial growth without adversely affecting private sector contributions (Iyoha & Oriakhi, 2002). In conclusion, Keynesian theory provides a robust theoretical framework for analyzing the impact of fiscal policy indicators on the non-oil industrial sector. By emphasizing government intervention through expenditure, taxation, and public debt, the framework underscores the importance of targeted fiscal policies in fostering industrial diversification. However, careful planning and execution are essential to maximize the benefits and minimize potential downsides such as inflation and crowding out of private investment (Keynes, 1936; Blinder, 2006).

Methodology

This study adopted an ex post facto research design to investigate the impact of fiscal policy indicators on Nigeria's non-oil industrial sector output, using annual time-series data from 1990 to 2024 sourced from the Central Bank of Nigeria, National Bureau of Statistics, Federal Ministry of Finance, and World Bank. The dependent variable is non-oil industrial sector output,

proxied by its GDP contribution, while independent variables include government capital expenditure, government revenue, domestic debt, and external debt. The study period spans significant economic transitions, including the post-SAP era, the 2014 GDP rebasing, and the COVID-19 pandemic, which may introduce structural breaks affecting time-series stability. To address this, the study employed structural break tests to detect regime shifts, and incorporates dummy variables for major policy or economic shocks. These adjustments enhance the robustness of the econometric analysis and ensure reliable long-run and short-run estimates within the VECM framework, accounting for fiscal dynamics and non-oil industrial performance.

Model Specification

The study adopted and use the Vector Error Correction Model (VECM) to estimate the long and short-run impacts of the economic variables. The foundation of the model was based on the theoretical framework of the study. Also, the initial model was adopted from the work of Yahaya (2020) examined the relationship between fiscal policy and non-oil industrial sector which was stated as follows:

$NOI = \alpha_0 + \beta_1 GEXP_t + \beta_2 GREV_t + \beta_3 PDB_t + \beta_4 PEB_t + \mu_t$

Where:

NOI = Non-oil Industrial Sector
GEXP = Government Expenditure
GREV = Government Revenue
PDBT = Public Domestic Debt
PEBT = Public External Debt

β0 is the constant term, 't' is the time trend and 'μ' is the random error term.

Data Presentation and Analysis

Table 4.1: Descriptive Statistics

	LOGNOI	LOGGEXP	LOGGREV	LOGDMD	LOGEXD
Mean	8.728893	6.219394	7.926814	7.803655	7.611899
Median	9.040946	6.482496	8.633446	7.682317	7.397255
Maximum	11.31159	8.502181	10.01340	11.20233	11.03668
Minimum	5.165643	3.178054	4.585987	4.431888	5.699138
Std. Dev.	1.745349	1.359610	1.597402	1.727035	1.412171
Skewness	-0.401061	-0.581653	-0.789547	-0.017689	0.661236
Kurtosis	2.139279	2.830762	2.307438	2.185896	2.535477
Jarque-Bera	2.018683	2.015303	4.335888	0.968358	2.865211
Probability	0.364459	0.365075	0.114413	0.616203	0.238686
Observations	35	35	35	35	35

Source: E-Views 12, 2025

Table 4.1 presents the descriptive statistics for the variables under study: non-oil industrial output (LOGNOI), government capital expenditure (LOGGEXP), government revenue (LOGGREV), public domestic debt (LOGDMD), and public external debt (LOGEXD) in Nigeria over 35 observations. The mean values show that non-oil industrial output (8.73) is relatively higher compared to the fiscal and debt indicators, indicating its significant role in the economy. Government revenue (7.93) on average outweighs government capital expenditure (6.22), reflecting the country's persistent challenge of low capital spending relative to revenue mobilization. Similarly, the average level of domestic debt (7.80) is higher than external debt (7.61), suggesting that the Nigerian government relies more on domestic borrowing to finance its fiscal operations.

The median values follow a similar pattern, with LOGNOI (9.04) being higher than the fiscal and debt measures. The range between maximum and minimum values indicates considerable variation across the study period. For instance, non-oil industrial output ranges from 5.16 to 11.31, while government revenue ranges from 4.59 to 10.01, highlighting fluctuations driven by economic cycles, oil price shocks, and policy changes. The standard deviation values also reinforce this variability, with LOGNOI (1.75) and LOGDMD (1.73) showing the highest levels of dispersion compared to other variables.

Regarding the distributional properties, skewness values show that LOGNOI, LOGGEXP, LOGGREV, and LOGDMD are negatively skewed, indicating distributions with longer left tails, while LOGEXD is positively skewed (0.66). The kurtosis values for all variables lie close to 3, implying that they approximate a normal distribution. The Jarque-Bera statistics and their corresponding probabilities further confirm this, as all variables have p-values greater than 0.05. This means the null hypothesis of normality cannot be rejected, suggesting that the data are approximately normally distributed and suitable for further econometric analysis.

Correlation Matrix

The Pearson correlation analysis matrix shows the relationship between the explanatory and the explained variable and the relationship among all pairs of independent variables themselves. According to Gujarati (2004), a correlation coefficient between two independent variables of 0.70 is considered excessive and thus certain measures are required to correct that anomaly in the data. The correlation matrix table is presented below;

Table 4.2: Correlation Analysis of the Variables

	LOGNOI	LOGGEXP	LOGGREV	LOGDMD	LOGEXD
LOGNOI	1.000000				
LOGGEXP	0.365492	1.000000			
LOGGREV	0.568218	0.540305	1.000000		
LOGDMD	0.481804	0.446150	0.526151	1.000000	
LOGEXD	0.598572	0.500003	0.619932	0.562495	1.000000

Source: E-Views 12, 2025

The correlation matrix in Table 4.2 revealed the relationship between non-oil industrial output (dependent variable) and its explanatory variables government capital expenditure, government revenue, domestic debt, and external debt. The results indicate that all correlation coefficients among the independent variables are below 0.70, suggesting no multicollinearity issues. Furthermore, non-oil industrial output exhibits positive correlations with all explanatory variables, implying that increases in government spending, revenue mobilization, and borrowing are generally associated with growth in Nigeria's non-oil industrial sector. This highlights the importance of fiscal policy in supporting non-oil industrial development.

Test for Stationarity

To avoid outcomes that may be considered spurious, as the unit root is normally associated with the majority of time series data, the study started by conducting the unit root test on the annual data for the variables (non-oil industrial sector output, government capital expenditure, government revenue, domestic debt, and external debt).

Variables	Test	T-statistic at Intercept	Critical value at 5%	Probability	Results
LOGNOI	ADF	-4.458815	-2.957110	0.0013	I(1)
LOGGEXP	ADF	-6.833975	-2.954021	0.0000	I(1)
LOGGREV	ADF	-5.169080	-2.957110	0.0002	I(1)
LOGDMD	ADF	-4.193167	-2.954021	0.0025	I(1)
LOGEXD	ADF	-3.933864	-2.954021	0.0048	I(1)

Table 4.3: Augmented Dickey-Fuller (ADF) Unit Root Test
Source: E-view 12 Output, 2025.

Table 4.3 presents the Augmented Dickey-Fuller (ADF) unit root test results for the variables. The findings show that all the variables non-oil industrial output (LOGNOI), government capital expenditure (LOGGEXP), government revenue (LOGGREV), public domestic debt (LOGDMD), and public external debt (LOGEXD) are stationary at first difference, I(1). This is evident as their respective t-statistics are more negative than the 5% critical values, and the associated probabilities are statistically significant at the 5% level.

For instance, LOGNOI has an ADF statistic of -4.46, which is lower than the 5% critical value of -2.96, with a probability of 0.0013, confirming stationarity at first difference. Similarly, LOGGEXP (-6.83), LOGGREV (-5.17), LOGDMD (-4.19), and LOGEXD (-3.93) all reject the null hypothesis of unit root at the 5% level. These results imply that the variables are integrated of order one and suitable for further econometric analysis involving co-integration tests and error correction modeling. The stationarity of the variables ensures that spurious regression is avoided and that reliable long-run and short-run relationships among government fiscal variables, debt indicators, and non-oil industrial output in Nigeria can be properly examined.

Co-integration Test

The co-integration test is necessary for a time series study because two or more variables may form long-term equilibrium relationships even though they may deviate from the equilibrium in the short run.

Table 4.4: Co-integration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.814209	122.4595	69.81889	0.0000
At most 1 *	0.637576	68.59928	47.85613	0.0002
At most 2 *	0.505464	36.12121	29.79707	0.0082
At most 3	0.285538	13.58888	15.49471	0.0949
At most 4	0.084631	2.829680	3.841466	0.0925

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.814209	53.86024	33.87687	0.0001
At most 1 *	0.637576	32.47808	27.58434	0.0108
At most 2 *	0.505464	22.53232	21.13162	0.0316
At most 3	0.285538	10.75920	14.26460	0.1667
At most 4	0.084631	2.829680	3.841466	0.0925

Source: E-view 12 Output, 2025.

The co-integration test results in Table 4.4 reveal the existence of a long-run relationship among non-oil industrial output, government capital expenditure, government revenue, domestic debt, and external debt in Nigeria. Both the Trace and Maximum Eigenvalue statistics confirm this, as the calculated values for up to three co-integrating equations are greater than their 5% critical values, with probabilities less than 0.05. This implies that although the variables may experience short-run fluctuations, they are tied together by a stable long-run equilibrium. In other words, fiscal policy variables influence the long-term performance of the non-oil industrial sector. The finding underscores the interdependence of government expenditure, revenue mobilization, and debt management in driving industrial growth in Nigeria. Consequently, the adoption of an error correction model (ECM) or vector error correction model (VECM) is justified to capture both the short-run dynamics and the long-run equilibrium adjustment process.

Vector Error Correction Model (VECM)

When time series are stationary at first difference for all the variables and the co-integration test displays the long-run co-integrating relationship between the variables the appropriate statistical tool for analysis becomes the Vector Error Correction Model (VECM). The results of the short and long-run relationships are presented in Tables 5 and 6 respectively.

Table 4.5: Error Correction Model

Error Correction:	D(LOGNOI)	D(LOGGEXP)	D(LOGGREV)	D(LOGDMD)	D(LOGEXD)
CointEq1	-0.122503	0.225271	-0.355948	0.593299	-1.790404
	(0.29139)	(0.55003)	(0.53806)	(0.24291)	(0.62066)
	[-0.42041]	[0.40956]	[-0.66153]	[2.44244]	[-2.88470]
D(LOGNOI(-1))	0.496449	0.098352	0.859470	-1.424824	-0.329184
	(0.44291)	(0.83604)	(0.81784)	(0.36922)	(0.94338)
	[1.12088]	[0.11764]	[1.05090]	[-3.85899]	[-0.34894]
D(LOGNOI(-2))	-0.046176	0.399285	-0.762250	0.142631	0.125966
	(0.37236)	(0.70286)	(0.68757)	(0.31041)	(0.79311)
	[-0.12401]	[0.56808]	[-1.10862]	[0.45950]	[0.15883]
D(LOGGEXP(-1))	0.068007	-0.092156	-0.010019	0.304917	-0.615621
	(0.16097)	(0.30385)	(0.29724)	(0.13419)	(0.34286)
	[0.42248]	[-0.30329]	[-0.03371]	[2.27227]	[-1.79553]
D(LOGGEXP(-2))	-0.021635	0.153996	0.031885	0.315496	-0.219477
	(0.12081)	(0.22804)	(0.22308)	(0.10071)	(0.25732)
	[-0.17909]	[0.67531]	[0.14293]	[3.13274]	[-0.85294]
D(LOGGREV(-1))	-0.253662	-0.068231	-0.249859	0.161464	0.198798
	(0.18773)	(0.35435)	(0.34664)	(0.15649)	(0.39985)
	[-1.35124]	[-0.19255]	[-0.72080]	[1.03176]	[0.49718]
D(LOGGREV(-2))	-0.112396	-0.352017	0.172538	-0.190051	-0.091034
	(0.19762)	(0.37303)	(0.36492)	(0.16474)	(0.42093)
	[-0.56874]	[-0.94366]	[0.47281]	[-1.15361]	[-0.21627]
D(LOGDMD(-1))	0.080595	0.048199	-0.157910	0.619353	-1.242367
	(0.27739)	(0.52360)	(0.51220)	(0.23124)	(0.59083)
	[0.29055]	[0.09205]	[-0.30830]	[2.67842]	[-2.10276]
D(LOGDMD(-2))	0.324478	1.037854	0.210611	1.026762	0.308292
	(0.41019)	(0.77427)	(0.75742)	(0.34194)	(0.87369)
	[0.79105]	[1.34042]	[0.27806]	[3.00272]	[0.35286]
D(LOGEXD(-1))	0.009919	-0.170731	0.059338	0.008473	-0.028896
	(0.09868)	(0.18626)	(0.18221)	(0.08226)	(0.21018)
	[0.10052]	[-0.91660]	[0.32565]	[0.10300]	[-0.13748]
D(LOGEXD(-2))	-0.009238	0.086213	-0.144809	0.142584	-0.193111
	(0.09260)	(0.17479)	(0.17098)	(0.07719)	(0.19723)
	[-0.09977]	[0.49325]	[-0.84693]	[1.84716]	[-0.97913]
C	0.068047	-0.059772	0.145896	0.012216	0.510964
	(0.08914)	(0.16827)	(0.16461)	(0.07431)	(0.18988)
	[0.76334]	[-0.35522]	[0.88632]	[0.16439]	[2.69104]
R-squared	0.356327	0.350581	0.281316	0.535090	0.600498
Adj. R-squared	0.002306	-0.006599	-0.113959	0.279389	0.380772
Sum sq. resids	0.605914	2.158904	2.065966	0.421072	2.748890
S.E. equation	0.174057	0.328550	0.321401	0.145099	0.370735
F-statistic	1.006514	0.981524	0.711697	2.092643	2.732943
Log likelihood	18.06202	-2.267867	-1.563825	23.88497	-6.133414

Akaike AIC	-0.378876	0.891742	0.847739	-0.742811	1.133338

Source: Eviews 12 output, 2025

The analysis in Table 4.5 presents the short-run estimates using the Vector Error Correction Model (VECM). The estimated coefficients of the error correction term (CointEq1) are significant in the domestic debt and external debt equations, with values of 0.5933 and -1.7904, respectively. This indicates that deviations from long-run equilibrium are corrected at an average speed of adjustment of about 59% for domestic debt and 179% for external debt annually. The negative sign in the external debt equation further confirms the presence of co-integration among the variables and shows that the system corrects past disequilibria in the short run. The short-run dynamics reveal that lagged government capital expenditure positively affects domestic debt, while past domestic debt significantly drives its own variations. In addition, domestic debt exerts a strong negative short-run effect on external debt, reflecting substitution between internal and external borrowing. Conversely, non-oil industrial output and government revenue show weak short-run adjustments, implying that their influence is more long-term in nature. The explanatory power of the model is higher for the debt equations, with R-squared values of 0.54 and 0.60 for domestic and external debt, respectively, compared to weaker explanatory strength for non-oil output (0.36), government expenditure (0.35), and government revenue (0.28). This shows that debt dynamics are better explained in the short run than output and fiscal variables. The F-statistics further validate the significance of the domestic and external debt models, while the log-likelihood and Akaike Information Criterion (AIC) confirm the overall model fit. These findings suggest that Nigeria's debt dynamics play a central role in short-run adjustments, whereas non-oil industrial output largely responds in the long run. Hence, effective debt management remains critical for supporting industrial performance and maintaining macroeconomic stability.

Table 4.6: Long-run Estimation

Cointegrating Eq:	CointEq1
LOGNOI(-1)	1.000000
LOGGEXP(-1)	-0.411503
	(0.04680)
	[-8.79262]
LOGGREV(-1)	0.082531
	(0.04178)
	[1.97544]
LOGDMD(-1)	-0.867842
	(0.04771)
	[-18.1896]
LOGEXD(-1)	0.122699
	(0.02042)
	[6.00817]
C	-1.004832

Source: Eviews 12 output, 2025

The result in Table 4.6 presents the long-run estimation from the cointegration equation. Non-oil industrial output (LOGNOI) is normalized as the dependent variable, while government capital expenditure, government revenue, domestic debt, and external debt serve as explanatory variables. The coefficient of government capital expenditure is -0.4115 and statistically significant at the 1% level, indicating that in the long run, increases in capital expenditure are associated with declines in non-oil industrial output. This may reflect the inefficiency of capital spending, diversion of funds, or weak implementation of capital projects in Nigeria.

Government revenue carries a positive coefficient of 0.0825, significant at the 5% level, implying that higher revenue mobilization supports industrial output in the long run. Domestic debt exerts a strong negative and highly significant effect (-0.8678), suggesting that rising domestic borrowing crowds out private sector credit and constrains industrial performance. In contrast, external debt shows a positive and significant effect (0.1227), indicating that foreign borrowing if well managed enhances industrial sector growth through the provision of additional resources. The constant term (-1.0048) reflects structural challenges that may limit industrial output irrespective of fiscal or debt influences. These results underscore the long-run importance of prudent fiscal management and sustainable debt strategies in fostering Nigeria's non-oil industrial sector.

Post Diagnostics Test

The following regression diagnostics tests were conducted to find out whether the data used for analysis were reliable. The researcher conducted a diagnostic test for Heteroscedasticity using the Breusch-Pagan-Godfrey test and the serial correlation. Diagnostic tests are performed to ensure that a good model is chosen, it checks whether the stochastic properties of the model are met in order to avoid conventional econometric problems.

Table 4.8: Breusch-Pagan-Godfrey Heteroscedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.732753	Prob. F(14,17)	0.7186
Obs*R-squared	12.04295	Prob. Chi-Square(14)	0.6029
Scaled explained SS	2.412566	Prob. Chi-Square(14)	0.9997

Source: Eviews 12 output, 2025

Basically, the presence of heteroskedasticity signifies that the variation of the residuals or term error is not constant which would affect inferences in respect of beta coefficient, coefficient of determination (R2) and F-statistic of the study. Based on the results, it can be concluded that there is no problem of heteroscedasticity as the F-statistics and its corresponding probability stand at 0.732753 and 0.7186 which is insignificant, implying that there is the absence of heteroscedasticity in the model.

Serial Correlation

This test is common to the econometric model as it assesses the validity of some of the modeling assumptions inherent in applying regression-like models to observed data series.

Table 4.9: Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.050936	Prob. F(2,15)	0.9600
Obs*R-squared	0.173711	Prob. Chi-Square(2)	0.9168

Source: Eviews 12 output, 2025

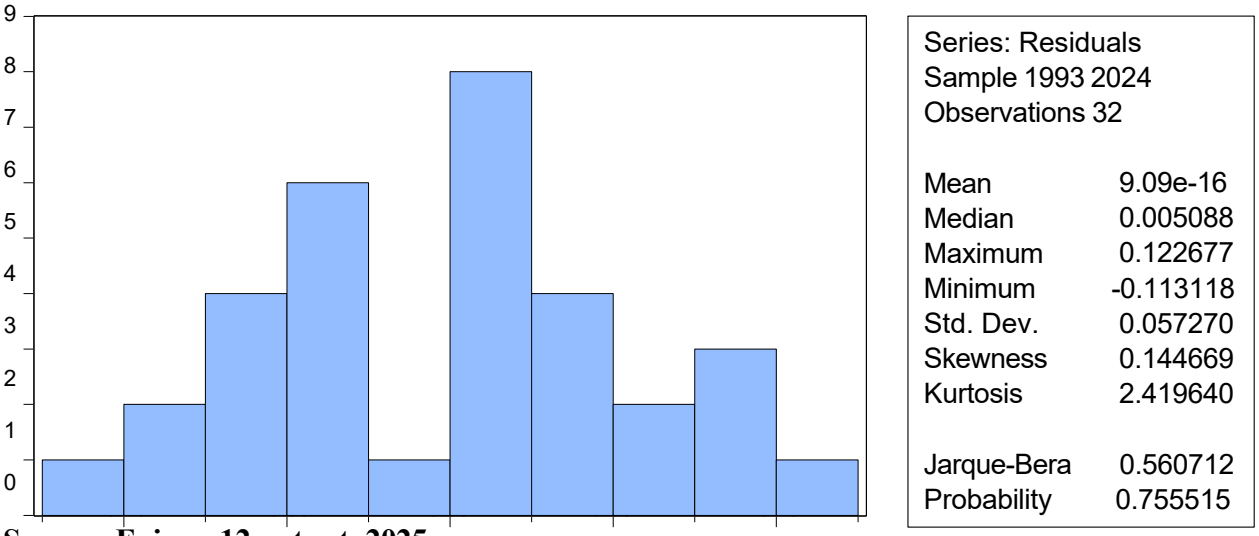
Serial correlation causes the estimated variances of the regression coefficients to be biased, leading to unreliable hypothesis testing. In this study it can be seen that there is no problem of serial

correlation as the probability of chi-square is greater 0.05 and suggest variables are not highly autocorrelated.

Test for Normality

An assessment of the normality of data is a prerequisite for many statistical tests because normal data is an underlying assumption in parametric testing. The normality test ascertains if the data is well modeled around a normal distribution.

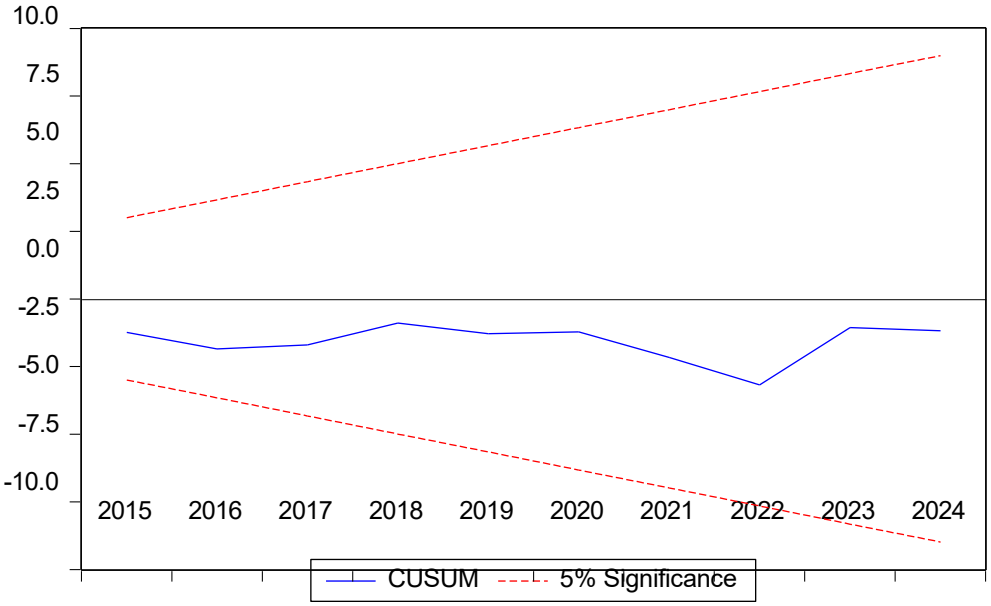
Fig 4.1: Normality Test



Source: Eviews 12 output, 2025

The residual test of normality indicates that the data was normally distributed because the probability of Jarque-Bera stood at 0.755517 which is greater than 0.05.

Figure I: Cusum Stability Tests



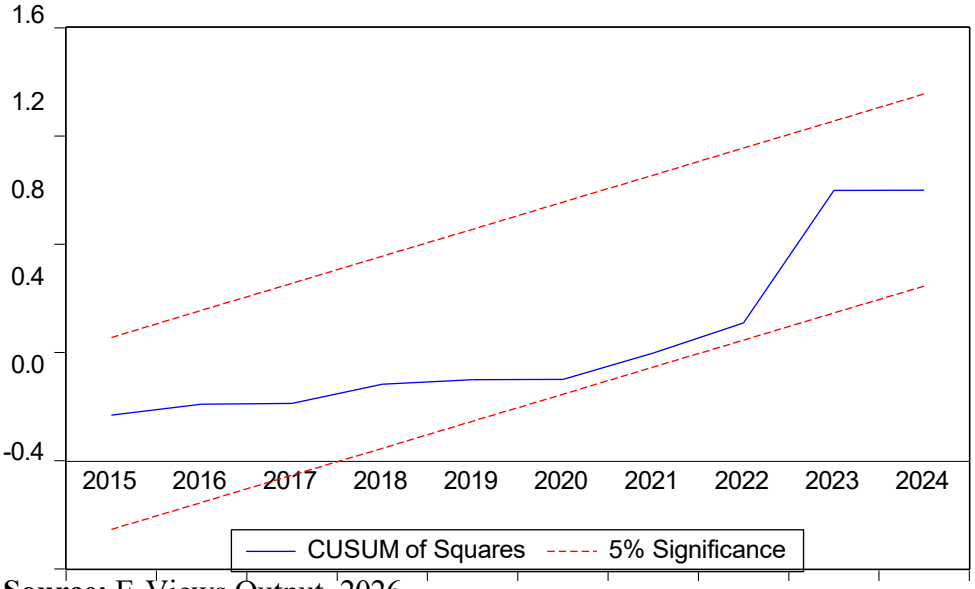
Source: E-Views Output, 2026

The CUSUM stability tests in Figure I revealed that the model is stable and the regression equation is correctly specified as the plots of the charts lie within the critical bounds at a 5% significant level.

Cusum Squared Test

CUSUMQ statistics are plotted against the critical bound of 5 percent significance. As noted by Bahmani-Oskooee and Wing NG (2002), if the plot of these statistics remains within the critical bound of the 5 percent significance level, the null hypothesis, which states that all coefficients in the error correction model are stable, cannot be rejected. The plots of the recursive residuals are presented in Figures I and II. The plot CUSUMQ residual is within the boundary. This implies that the parameters of the models have remained stable within their critical bounds.

Figure II: Cusum Squared Tests



Source: E-Views Output, 2026

The CUSUM squared tests in Figure II revealed that the model is stable and the regression equation is correctly specified as the plots of the charts lie within the critical bounds at a 5% significant level. The figure above shows that the plot of CUSUM squared for the model under consideration is within the 5 percent critical bound. This by implication suggests that the parameters of the model do not suffer from any structural instability over the period of study. That is, all the coefficients in the error correction model are stable.

Discussion of Findings

The findings reveal a critical distinction between short-run associations and long-run equilibrium effects. While preliminary correlation analysis suggested a positive link between fiscal variables and industrial output, the long-run cointegrating equation from the VECM provides a more robust and reliable basis for policy inference. This approach controls for dynamic interactions and endogeneity, revealing that the long-run impact of fiscal tools can diverge from simple correlations.

Specifically, the long-run model shows that government capital expenditure and domestic debt significantly constrain non-oil industrial output. This negative long-run effect likely stems from structural inefficiencies where capital spending is poorly implemented or diverted, and domestic borrowing crowds out private sector credit. In contrast, government revenue and external debt exhibit positive long-run coefficients, suggesting they enhance output when funds are prudently managed. Thus, the sign reversal is explained by the shift from short-run correlations to a long-run structural model that captures these deeper economic relationships.

Conclusion

This study examined the effect of fiscal policy indicators on non-oil industrial sector output

in Nigeria from 1990 to 2023 using the Vector Error Correction Model (VECM). The findings reveal that fiscal policy instruments exert differential long-run impacts on industrial performance based on the VECM estimates. Government capital expenditure shows a statistically significant negative coefficient, indicating that current capital spending patterns constrain rather than enhance non-oil industrial output. Public external debt demonstrates a statistically significant positive coefficient, suggesting foreign borrowing supports industrial growth when effectively utilized. Public domestic debt exhibits a strong statistically significant negative coefficient, confirming that domestic borrowing crowds out private sector credit and impedes industrial expansion. Government revenue shows a weakly significant positive coefficient, indicating limited impact due to structural mobilization weaknesses.

Recommendations

Based on the findings, the following recommendations are made:

Government should reform capital expenditure implementation processes to address the negative impact on industrial output. This requires strengthening project planning, procurement transparency, and completion monitoring to ensure capital spending translates into productive infrastructure that supports industrial growth.

Government should reduce domestic borrowing levels given its strong negative effect on industrial output. Lower domestic debt will ease interest rates, improve private sector credit access, and create fiscal space for productive investments.

Government should maintain external borrowing but strengthen utilization frameworks to sustain its positive contribution to industrial output. This involves securing favorable terms, ensuring funds target industrial infrastructure, and maintaining debt sustainability to preserve long-term benefits.

Government should address revenue mobilization weaknesses to potentially strengthen its modest positive effect. Tax administration reforms and revenue base diversification can enhance fiscal capacity for industrial support.

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