Monetary Policy Transmission and Manufacturing Output in Nigeria: Does Domestic Investment Matter?

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Abstract

This study investigates the effects of monetary policy and domestic investment on manufacturing output in Nigeria using the Autoregressive Distributed Lag (ARDL) approach, covering the period from 1980 to 2023. The long-run results reveal that the monetary policy rate has a significantly negative effect on manufacturing output, suggesting that higher interest rates impede industrial growth. In contrast, broad money supply, lending interest rate, exchange rate depreciation, and domestic investment exert positive and statistically significant impacts on manufacturing performance. Inflation, while negative, remains statistically insignificant, highlighting the complex and often inconclusive relationship between price levels and output in developing economies. In the short run, lagged monetary policy rate and domestic investment significantly enhance manufacturing output, whereas recent exchange rate depreciation temporarily constrains growth due to increased input costs. The error correction term confirms the existence of a stable long-run relationship, with a moderate speed of adjustment. The study concludes that enhancing manufacturing sector performance in Nigeria requires a balanced and responsive monetary policy, improved financial liquidity, greater domestic investment, and strategic exchange rate management. Policy recommendations include the implementation of

targeted credit interventions, financial sector reforms, investment-friendly policies, and coordinated macroeconomic strategies to promote sustainable industrial development.

Keywords: Monetary Policy, Manufacturing Output, Domestic Investment, Nigeria

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Introduction

Monetary policy transmission refers to the mechanism through which changes in the monetary policy stance affect real economic activities such as investment, output, and employment. In the context of developing economies like Nigeria, the effectiveness of monetary policy transmission to the real sector particularly the manufacturing industry has attracted significant academic and policy interest (Anthony, & Kenechukwu, 2025). The manufacturing sector is widely acknowledged as a vital engine for economic growth, employment generation, and industrial transformation (World Bank, 2023). However, the persistent underperformance of Nigeria's manufacturing sector, despite various monetary interventions, raises critical questions about the channels and effectiveness of monetary policy in stimulating productive investment and output (Sasso, et al., 2025).

In recent years, the Nigerian economy has experienced volatile macroeconomic conditions characterized by fluctuating interest rates, inflationary pressures, exchange rate instability, and inconsistent credit supply, all of which influence the transmission of monetary policy (CBN, 2023; Nadabo, 2021). These factors often create distortions that hinder the smooth functioning of the monetary transmission mechanism, thereby limiting its impact on real sector productivity. Among the potential factors mediating this process is domestic investment, which serves as a critical conduit for translating monetary impulses into tangible increases in output (Nadabo, & Maigari, 2021). When domestic investment is vibrant, monetary policy tools such as interest rate adjustments and money supply changes can more effectively stimulate manufacturing activity (Odionye, et al., 2025; Abdulle et al., 2025).

Despite the theoretical expectation of a positive linkage, empirical evidence on the relationship between monetary policy and manufacturing output in Nigeria remains inconclusive and often contradictory. Some studies indicate that restrictive monetary policies dampen manufacturing performance due to rising costs of borrowing and reduced access to credit (Nadabo, 2023), while others argue that a well-targeted expansionary policy may boost investment and industrial productivity (Colak, et al., 2025). More critically, the role of domestic investment as a moderating factor in this relationship has received relatively limited empirical exploration.

This study, therefore, investigates the transmission of monetary policy to manufacturing sector output in Nigeria, focusing on the role of domestic investment. By employing recent macroeconomic data and advanced econometric techniques, the study seeks to provide updated insights into whether domestic investment amplifies or dampens the effectiveness of monetary policy on industrial output. In doing so, it contributes to the broader policy discourse on how Nigeria can harness monetary policy more effectively to achieve industrial development, economic diversification, and sustainable growth.

The remainder of this paper is structured as follows. Section 2 presents a review of relevant empirical literature. Section 3 outlines the data sources and methodological framework. Section 4

discusses the empirical results and key findings. Finally, Section 5 concludes the study with policy recommendations for enhancing monetary policy effectiveness in stimulating manufacturing-led growth in Nigeria.

Review of Empirical Literature

A considerable number of empirical studies have investigated the relationship between monetary policy and manufacturing output in Nigeria. These studies provide mixed findings depending on the variables used, the methodological approaches adopted, and the periods covered. To begin with, Segun and Adebayo (2018) investigated the impact of the exchange rate on industrial output in Nigeria using time series data spanning from 1986 to 2016. The variables included exchange rate, labour, industrial output, and capital. Employing the Ordinary Least Squares (OLS) method, their findings revealed that the exchange rate significantly affects manufacturing output, albeit only in the short run. In a related study, Ezeaku et al. (2018) examined the transmission effects of monetary policy on Nigeria's manufacturing sector using data from 1981 to 2014. The key variables considered were private sector credit, exchange rate, and interest rate. Applying the Error Correction Model (ECM), the study found that while the transmission channels had a negative short-run effect on manufacturing output, they exerted a positive influence in the long run. Similarly, Goshit, Dabwor, and Kromtit (2018) explored the contribution of monetary policy to manufacturing output using data from 1986 to 2015. The study employed Granger causality and the Two-Stage Least Squares (2SLS) regression techniques, revealing that monetary policy instruments had no significant effect on manufacturing output in Nigeria.

In contrast, Egbulonu and Ukwuoma (2018) assessed the impact of monetary policy on manufacturing sector growth between 1980 and 2012. Using the Autoregressive Distributed Lag (ARDL) bounds test, the results indicated that money supply had a positive and significant impact on output in both the short and long run. However, the exchange rate had a negative and insignificant effect, while the interest rate was positive but not a significant determinant of output. Furthermore, Osakwe, Ibenta, and Ezeabasili (2019) examined the performance of monetary policy using variables such as the monetary policy rate, cash reserve ratio, treasury bill rate, and money supply over the period 1986–2017. Employing the ARDL model, they identified short-run impacts of monetary policy on manufacturing output. Likewise, Shobande (2019) analyzed the transition from direct to indirect monetary policy on industrial growth from 1960 to 2015. Using ARDL, the study found that domestic credit, interest rate, and trade balances positively influenced industrial output, while inflation, money supply, and exchange rate had a negative long-run impact, though all variables were significant in the short run. Continuing in this direction, Ayunku and Olulu-Briggs (2020) investigated the relationship between monetary policy and manufacturing performance, using contribution to GDP as the dependent variable, and money supply and lending rate as independent variables. Based on VECM results for the 1981–2018 period, a significant relationship was found among the variables.

In the same vein, Hammed (2020) studied the impact of monetary policy shocks using Structural Vector Auto-Regressive (SVAR) models and time series data from 1981 to 2018. The findings indicated that broad money supply had a positive and significant impact on manufacturing output, whereas the interest rate was negative and statistically insignificant. Equally important, Ibbih, Anzaku, and Ogwuche (2020) examined the influence of monetary policy on manufacturing value-added using ARDL. The variables included policy rate, prime lending rate, open market

operations, and broad money supply. Results showed that broad money was significant in the short run, while sectoral credit had long-run significance. Moreover, Akpunonu and Orajaka (2021) used OLS regression on data from 1986 to 2019 to study treasury bills, cash reserve ratio, and monetary policy rate. The results demonstrated that all variables, except the monetary policy rate, had positive and significant effects on manufacturing sector GDP.

Similarly, Obi (2021) examined monetary policy instruments monetary policy rate, treasury bill rate, and cash reserve ratio using ARDL bound testing over 1987 to 2019. Findings showed that the monetary policy rate and money supply positively and significantly influenced manufacturing output, while the treasury bill rate was not significant in the short run. Expanding beyond Nigeria, Famoroti and Omolade (2022) assessed monetary policy shocks in 12 ECOWAS countries using a quarterly panel SVAR model from 1980 to 2017. The results suggested that monetary policy had no significant effect on economic growth but significantly impacted the general price level. Likewise, Ogbonna et al. (2022) conducted a panel ARDL study across selected African economies from 1986 to 2021. Their analysis revealed a significant relationship between monetary policy variables (interest rate, cash reserve ratio, inflation, and money supply) and manufacturing output in the countries studied. Domestically, Nwankwor, Ikeora, and Promise (2022) investigated the effect of monetary policy instruments on manufacturing sector output in Nigeria from 1987 to 2019 using OLS cointegration. Their findings confirmed a positive and significant effect of money supply, monetary policy rate, and treasury bill rate on output.

Additionally, Samuel and Wale-Odunaiya (2021) focused on exchange rate undervaluation and its effects on manufacturing production and economic growth from 1981 to 2019. Utilizing the VECM and impulse response function, they observed that the real effective exchange rate negatively impacted manufacturing output with no discernible effect on economic growth. Onwuka (2022) employed ARDL and ARCH/GARCH models to assess the effect of exchange rate volatility on manufacturing performance. The findings showed that interest rate, inflation, and exchange rate volatility had adverse long-term effects on the sector. Correspondingly, Mboto et al. (2022) applied OLS to assess the influence of money supply and exchange rate on manufacturing output from 1990 to 2020. Results indicated a positive and significant effect of money supply and a negative impact from exchange rate fluctuations, recommending local input sourcing via agricultural and technical policy initiatives. Similarly, Orji and Ezeanyaeji (2022) used the Canonical Cointegrating Regression (CCR) approach to explore how exchange rate affects industrial performance. The findings revealed that exchange rate depreciation constrained output, and volatility in exchange rates worsened manufacturing performance. Oyedepo, Rasaki, and Addo (2023) investigated the impact of exchange rate fluctuations on Nigeria's manufacturing sector between 1990 and 2020. Applying the ARDL model, they found that raw material imports and exchange rate volatility negatively affected output in the short run. However, a positive relationship existed between GDP and capacity utilization in the long run.

While many studies have examined the impact of monetary policy on Nigeria's manufacturing sector, few have considered the mediating role of domestic investment. Most focus solely on direct effects of monetary variables, neglecting how these influence investment and, in turn, manufacturing performance. Additionally, existing research often uses linear models that fail to capture dynamic interactions or structural changes, highlighting the need for studies that integrate domestic investment as a key transmission channel.

Methodology

3.1 Theoretical Framework

This study adopts Keynesian and Post-Keynesian theoretical perspectives to explain how monetary policy influences manufacturing sector performance through domestic investment. According to Keynesian theory, monetary policy impacts the real sector indirectly via interest rates, especially in economies operating below full employment (Lofaro, et al., 2025). Post-Keynesian theory further emphasizes the cost of capital as the main channel, where lower interest rates reduce borrowing costs, thus encouraging domestic investment, which ultimately increases output (Kopiec, & Walerych, 2025; Levrero, & Lofaro, 2025).

Expansionary monetary policy increases money supply (↑M), leading to a fall in real interest rates (↓ir). This lowers the cost of capital, stimulates domestic investment (↑I) in manufacturing, and results in higher aggregate output (↑Y):

↑M→↓ir→↑I→↑Y (1)

In open economies, a decrease in domestic interest rates (↓ir) following an expansionary money supply (↑M) leads to currency depreciation (↓E), making exports more competitive. This increases net exports (↑NX) and raises output (↑Y):

↑M→↓ir→↓E→↑NX→↑Y (2)

Expansionary monetary policy increases bank reserves and deposits (↑bank deposits), enhancing banks' capacity to lend. More bank loans (↑bank loans) stimulate domestic investment (↑I), particularly in capital-intensive sectors like manufacturing, thereby increasing output (↑Y):

↑M→↑bank deposits→↑bank loans→↑I→↑Y (3)

In the Nigerian context, financial sector reforms in the 1980s marked a shift from direct controls to indirect policy instruments such as Open Market Operations (OMO); these reforms prioritized interest and exchange rate channels for transmitting monetary policy to the real sector (Figuera, & Pacella, 2025). Empirical findings from a Central Bank of Nigeria (CBN) study showed that while the exchange rate channel was particularly strong between 1980 and 2005, the interest rate and credit channels were relatively weak during that period (CBN, 2023; Nadabo, & Dakyong, 2023; Oladejo, et al., 2025).

Overall, this framework establishes that domestic investment serves as a critical conduit through which monetary policy variables such as interest rates, money supply, and exchange rates affect the performance of the manufacturing sector in Nigeria.

3.2 Models Specification

In line with the objectives of this study, econometric models are specified based on the theoretical framework of the monetary policy transmission mechanism. The models capture the relationship between manufacturing output and key monetary policy variables. Specifically, manufacturing output is modeled as a function of the monetary policy rate, broad money supply, lending interest rate, exchange rate, and the moderating variable, domestic investment, as specified in Equation (4).

$$MANF_t = \beta_0 MOPR_t + \beta_1 EXRT_t + \beta_2 INFN_t + \beta_3 DINV_t + \beta_4 BM2_t + \beta_0 LINR_t + \varepsilon_t \quad (4)$$

Where MANF represents manufacturing output, MOPR denotes the monetary policy rate, BM2 stands for broad money supply, LNIR refers to the lending interest rate, EXRT is the exchange rate, INFN represents the inflation rate, and DINV indicates domestic investment. ε_t denotes the stochastic (random) error term with zero mean and constant variance. β_0 is the constant term, while β_1, β_2, β_3, β_4 and β_5 represent the long-run parameters to be estimated.

Table: Measurement of Variables and Data Sources

Variable	Variable Abbreviation	Measurement	Source
Manufacturing Output	MANF	Measured as the net value added in the manufacturing sector at basic prices.	Central Bank of Nigeria (CBN, 2023)
Monetary Policy Rate	MOPR	Measured as a percentage (%)	Central Bank of Nigeria (CBN, 2023)
Broad Money Supply	BM2	Measured in local currency units (₦), includes M2 components	World Bank (WDI, 2023)
Lending Interest Rate	LNIR	Measured as annual lending rate (%)	World Bank (WDI, 2023)
Exchange Rate	EXRT	Expressed as ₦ per US dollar (₦/US$)	World Bank (WDI, 2023)
Inflation Rate	INFN	Measured as annual percentage change in the Consumer Price Index (CPI)	World Bank (WDI, 2023)
Domestic Investment	DINV	Measured as gross fixed capital formation (% of GDP)	World Bank (WDI, 2023)

3.3 Technique of Data Analysis

This study employs the Autoregressive Distributed Lag (ARDL) model, as originally developed by Pesaran and Shin (1999) and extended by Pesaran, Shin, and Smith (2001), to examine both the short-run dynamics and long-run relationships among the variables. Prior to estimating the ARDL model, unit root tests were conducted to determine the stationarity properties of the data series.

3.3.1 Unit Root/Stationarity Tests

Although the ARDL model does not require all variables to be stationary at the same level, conducting unit root tests ensures the validity and suitability of the model. Therefore, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were used to examine whether the variables are integrated at level [I(0)], first difference [I(1)], or a combination of both. This helps avoid spurious regression results and confirms that none of the variables are integrated at second difference [I(2)], which would invalidate the ARDL approach (Udoudo, et al., 2024).

3.3.2 ARDL Model Framework

The ARDL bounds testing approach is adopted to investigate the existence of cointegration among manufacturing output and key explanatory variables. This technique is suitable for small sample sizes and can accommodate regressors that are a mix of I(0) and I(1). It provides robust and reliable estimates compared to other cointegration techniques such as the Johansen approach.

The ARDL model offers several advantages: it addresses endogeneity concerns by minimizing residual correlation, distinguishes between dependent and independent variables, and allows the derivation of the Error Correction Model (ECM) that captures both short-run dynamics and long-run equilibrium. This makes ARDL a flexible and powerful tool for analyzing economic relationships (Pesaran et al., 2001).

$$\Delta(MANF)_t = a_0 + a_1(\mathrm{MANF})_{t-1} + a_2(\mathrm{INFN})_{t-1} + a_3(\mathrm{EXRT})_{t-1} + a_4(\mathrm{MOPR})_{t-1} + a_5(\mathrm{BM2})_{t-1} + a_6(\mathrm{DINV})_{t-1} + a_7(\mathrm{LNIR})_{t-1} + \sum_{i=1}^{p} \beta_1 \Delta(MANF)_{t-i} + \sum_{i=0}^{q} \beta_2 \Delta(INFN)_{t-i} + \sum_{i=0}^{r} \beta_3 \Delta(EXRT)_{t-i} + \sum_{i=0}^{s} \beta_4 \Delta(DINV)_{t-i} + \sum_{i=0}^{t} \beta_5 \Delta(MOPR)_{t-i} + \sum_{i=0}^{u} \beta_6 \Delta(LNIR)_{t-i} + \sum_{i=0}^{v} \beta_7 \Delta(BM2)_{t-i} + \mu_t \quad (5)$$

Where MANF represents manufacturing output, MOPR denotes the monetary policy rate, BM2 stands for broad money supply, LNIR refers to the lending interest rate, EXRT is the exchange rate, INFN represents the inflation rate, and DINV indicates domestic investment. $\beta_1, \beta_2, \beta_3,$ and $\beta_4,$ are short run parameters estimated, Δ denotes first difference, ln means logarithm and p, *q, r, s* are the optimal lag length for the short run ARDL model. In order to obtain the short-run coefficients, we specified and estimated the following ARDL-ECM:

$$\Delta(MANF)_t = + \sum_{i=1}^{p} \beta_1 \Delta(MANF)_{t-i} + \sum_{i=0}^{q} \beta_2 \Delta(INFN)_{t-i} + \sum_{i=0}^{r} \beta_3 \Delta(EXRT)_{t-i} + \sum_{i=0}^{s} \beta_4 \Delta(DINV)_{t-i} + \sum_{i=0}^{t} \beta_5 \Delta(MOPR)_{t-i} + \sum_{i=0}^{u} \beta_6 \Delta(LNIR)_{t-i} + \sum_{i=0}^{v} \beta_7 \Delta(BM2)_{t-i} + \beta_5 ECT_{t-1} + \mu_t \quad (6)$$

Where: β_5 is the coefficient of correction term ECT_{t-1} in the ECM-ARDL model specified in equation 6. It is important to note that ECT_{t-1} represents the long run dynamics of all the variables attached the coefficients $a_1 - a_4$ in equation 5.

4. Results and Discussions

Table 1: Descriptive Statistics and Correlation Matrix

Statistic	MANF	MOPR	BM2	LNIR	EXRT	INFN	DINV
Mean	5.869	13.038	1.188	1.229	100.760	1.500	2.581
Minimum	4.430	6.008	0.957	0.950	0.618	0.195	2.489
Maximum	7.291	26.000	1.437	1.500	358.811	1.862	2.710
Std. Deviation	0.907	4.002	0.150	0.126	100.728	0.297	0.066
Observations	40	40	40	40	40	40	40
Correlation Matrix							
MANF	1.000						
MOPR	-0.005	1.000					
BM2	0.775	-0.144	1.000				
LNIR	0.312	0.751	0.050	1.000			
EXRT	0.902	-0.060	0.798	0.093	1.000		
INFN	-0.265	0.334	-0.232	0.309	-0.273	1.000	
DINV	0.243	0.502	-0.355	0.266	-0.267	-0.104	1.000

Table 1 presents the descriptive statistics of the variables used in the study. The mean value of manufacturing output (MANF) is 5.869, with a minimum of 4.430 and a maximum of 7.291, indicating moderate variability (standard deviation = 0.907). The monetary policy rate (MOPR) has an average of 13.038, ranging from 6.008 to 26.000, and exhibits a high level of variability, as shown by a standard deviation of 4.002. Broad money supply (BM2) has a mean of 1.188 and a relatively low standard deviation of 0.150, reflecting modest fluctuations.

Lending interest rate (LNIR) has a mean of 1.229 and is relatively stable, with a standard deviation of 0.126. The exchange rate (EXRT) shows substantial variation, with a mean of 100.760, a minimum of 0.618, and a maximum of 358.811, alongside a high standard deviation of 100.728. Inflation rate (INFN) has a mean of 1.500 and moderate variability (standard deviation = 0.297). Domestic investment (DINV) is relatively stable with a mean of 2.581 and a low standard deviation of 0.066. Each variable consists of 40 observations.

The correlation matrix reveals the linear relationships among the variables. Manufacturing output (MANF) is strongly positively correlated with broad money supply (BM2) at 0.775 and very

strongly positively correlated with exchange rate (EXRT) at 0.902. This suggests that increases in money supply and exchange rate movements (possibly depreciation) are associated with increased manufacturing output. A weak positive correlation of 0.312 is observed between MANF and lending interest rate (LNIR), while a weak negative correlation (-0.265) is found between MANF and inflation (INFN). Interestingly, the correlation between MANF and the monetary policy rate (MOPR) is negligible (-0.005), suggesting little to no direct linear relationship. Manufacturing output also has a weak positive correlation (0.243) with domestic investment (DINV).

Further correlations show that MOPR is strongly positively correlated with LNIR (0.751), indicating a strong policy transmission effect from monetary policy rate to lending rate. BM2 is highly correlated with EXRT (0.798), suggesting a close relationship between money supply and exchange rate dynamics. DINV has a moderate positive correlation with MOPR (0.502) and weak correlations with other variables.

Table 2: Results of Unit Root Tests – ADF and PP

Variables	ADF (Level)	ADF (1st Diff.)	PP (Level)	PP (1st Diff.)	Stationary Status
MANF	-1.474	-4.819***	0.071	-4.796***	I(1)
MOPR	-3.302*	-----	-3.262	-----	I(0)
BM2	-1.442	-8.191***	-2.274	-0.906	I(1)
LNIR	-2.357	-4.499***	-2.374	-5.984***	I(1)
EXRT	2.250	-4.153**	2.490	-4.099**	I(1)
INFN	-3.533*	-----	-3.408*	-----	I(0)
DINV	-5.551**	-----	-3.661**	-----	I(0)

Note: ***, **, * indicate significance level at 1%, 5% and 10%, respectively
Source: Authors' calculation.

The results of the unit root tests presented in Table 2 reveal the stationarity properties of the variables used in the study, based on both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The tests were conducted at levels and at first difference, with significance evaluated at the 1%, 5%, and 10% levels. MOPR, INFN, and DINV are stationary at level, suggesting they are integrated of order zero, I(0), while the remaining four variables MANF, BM2, LNIR, and EXRT become stationary only after first differencing, indicating they are integrated of order one, I(1). The mixed order of integration among the variables supports the application of the ARDL bounds testing approach for further cointegration analysis.

Table 3: Result of Cointegration Test

Dependent Variable	Function	F-Statistic (k=4)		
		10%	5%	1%

MANF	f(MOPR, BM2, LNIR, EXRT, INFN, DINV)	**41.7300**	I(0) 2.20 I(1) 3.09	I(0) 2.56 I(1) 3.49	I(0) 3.29 I(1) 4.37

Source: Author's calculation.

Since the computed F-statistic (41.7300) exceeds the upper bound critical values at all significance levels (1%, 5%, and 10%), it confirms the existence of a long-run cointegration relationship among the variables.

Table 4: Results of ARDL Estimation

Panel A: Long-run Coefficients (Dependent Variable: MANF)				
Variable	Coefficient	Std. Error	T-ratio	Prob.
MOPR	-0.058**	0.026	-2.256	0.038
BM2	1.844***	0.613	3.070	0.009
LNIR	4.112***	0.626	6.573	0.000
EXRT	0.005***	0.001	6.325	0.000
INFN	-0.045	0.060	-0.755	0.464
DINV	0.012**	0.003	4.016	0.002
C	-0.569	1.696	-0.818	0.426
Panel B: Short-run Coefficients (Dependent Variable: D(MANF))				
D(MOPR)	0.000	0.002	0.225	0.825
D(MOPR(-1))	0.010***	0.002	4.704	0.000
D(BM2)	0.102	0.084	1.275	0.221
D(LNIR)	-0.003	0.098	-0.039	0.973
D(EXR)	-0.000	0.000	-0.326	0.749
D(EXR(-1))	-0.001***	0.000	-3.206	0.006
D(DINV)	0.055*	0.027	2.026	0.064
D(DINV(-1))	7.603**	2.122	3.584	0.003
ECT(-1)	-0.175***	0.010	-18.128	0.000

Notes: D denotes the first difference operator. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.
Source: Author's computation

The results of the ARDL estimation, as presented in Table 4, provide insights into both the long-run and short-run determinants of manufacturing output (MANF) in the context of Nigeria. In the long run, the monetary policy rate (MOPR) exerts a significantly negative effect on manufacturing output, indicating that an increase in policy rates discourages investment and reduces output. This finding is in line with the Keynesian transmission mechanism, which posits that higher interest rates increase borrowing costs, thereby reducing investment in the real sector, including manufacturing. It aligns with Abiola, (2024) and is supported by Okeke, & Adeyeye, (2024), who found that contractionary monetary policy adversely affects industrial productivity in Nigeria. Similarly, Ohazurike, & Igwe, (2024) also emphasized that tight monetary policy instruments tend to crowd out productive sector activities in developing economies. These findings consistently support the argument that the monetary policy rate, as a cost of capital indicator, has a significant dampening effect on manufacturing output in the long run.

Conversely, broad money supply (BM2) has a positive and significant effect on manufacturing output. A 1% increase in money supply results in a 1.84% increase in manufacturing output, suggesting that liquidity in the economy enhances production. This supports the Monetarist view notably that of Friedman (2017), which underscores the importance of money supply in influencing output levels. Empirically, this is consistent with the findings of Nadabo and Salisu (2021), which highlight the productivity-enhancing role of liquidity in the Nigerian economy. In addition, the lending interest rate (LNIR) also shows a positive and significant coefficient, indicating that higher lending rates are associated with increased manufacturing output. While this appears counterintuitive from a classical economic perspective, it could reflect structural realities in the Nigerian credit market where high lending rates may be correlated with inflationary expectations or sectors with high returns, encouraging risk-taking. This aligns with some Post-Keynesian perspectives, which argue that credit rationing and institutional factors may mediate the relationship between interest rates and output (see Lavoie, 2012; Krishna 2025).

The exchange rate (EXRT) has a positive and statistically significant effect on manufacturing output in the long run. This suggests that currency depreciation boosts manufacturing performance, likely by encouraging import substitution and making locally produced goods more competitive. This result supports the elasticity approach to exchange rates and is consistent with empirical studies such as Ahmadian-Yazdi, et al. (2025), Nadabo, et al., (2024b) and Liao, & Zhang, (2025), which emphasize the potential benefits of managed depreciation in promoting local industries. Inflation (INFN), however, exhibits a negative but statistically insignificant effect, implying that although rising inflation may erode purchasing power and increase production costs, its impact on manufacturing output in the long run is not conclusive in this model. This result reflects the mixed findings in existing literature on inflation-output dynamics, especially in developing economies characterized by macroeconomic volatility and price instability. For instance, Lofaro, et al., (2025) found that inflation exerts an uncertain influence on industrial growth in Nigeria due to structural rigidities and price shocks. Similarly, Nadabo, & Salisu, (2025) observed that inflation had no statistically significant impact on real sector performance, attributing this to inflation expectations already being factored into production costs. These studies highlight the complexity of inflation-output relationships in countries with weak monetary anchors and suggest that inflation alone may not significantly drive long-term changes in manufacturing output.

Additionally, domestic investment (DINV) is shown to have a positive and significant long-run effect on manufacturing output. A 1% increase in domestic investment leads to a 0.012% rise in

output, confirming the crucial role of investment in expanding industrial capacity. This finding is consistent with the Accelerator theory of investment, which argues that investment is driven by expected changes in demand. It also supports endogenous growth theories, which posit that capital accumulation through investment is vital for sustainable growth. Studies such as Nadabo, et al., (2024a) and Nadabo, and Abdullahi, (2024) also emphasize the positive impact of domestic investment on productive sector growth in Nigeria.

In the short run, the model reveals dynamic effects. Notably, the lagged monetary policy rate (D(MOPR(-1))) has a positive and significant effect on manufacturing output, suggesting a delayed response of the sector to policy changes. This confirms the common monetary policy lag identified in real-world settings. The exchange rate (D(EXRT(-1))) shows a negative short-run effect, indicating that recent currency depreciation may initially raise production costs due to reliance on imported inputs, before longer-term gains in competitiveness set in. Short-run domestic investment (both current and lagged) positively influences manufacturing output. The coefficient for D(DINV(-1)) is significant, implying that past investments have a strong delayed impact on output growth. This reinforces the investment-led growth hypothesis and validates the role of capital accumulation in increasing productive capacity over time. The error correction term (ECT(-1)) is negative and highly significant, confirming the existence of a stable long-run relationship. The coefficient of -0.175 implies that about 17.5% of deviations from the long-run equilibrium are corrected each period, suggesting moderate speed of adjustment.

4.4 Result of the Diagnostic Tests

To ensure the validity and robustness of the ARDL-ECM model, several post-estimation diagnostic tests were conducted. These tests were aimed at detecting possible issues related to serial correlation, heteroscedasticity, and non-normality of residuals.

Table 5: Model Diagnostic Tests

Test	Test Statistic (p-value)
Serial Correlation (Breusch-Godfrey LM Test)	0.4907 (0.2816)
Heteroscedasticity (Breusch-Pagan-Godfrey Test)	0.8147 (0.6684)
Functional Form (Ramsey RESET Test)	0.8248 (0.8284)
Normality (Jarque-Bera Test)	2.9760 (0.8248)
Result of Stability Tests (CUSUM and CUSUMSQ)	Stable

Note: Probability values are shown in parentheses.
Source: Author's computation

The results presented in Table 6 indicate that the ARDL-ECM model passed all the diagnostic checks. In each case, the probability values exceed the 5% significance level, implying that the null hypotheses for no serial correlation, no heteroscedasticity, normality of residuals, and correct model specification cannot be rejected. Therefore, the model is deemed statistically reliable and correctly specified.

5. Conclusion and Policy Implication

The ARDL estimation results provide compelling evidence on the long-run and short-run drivers of manufacturing output (MANF) in Nigeria. In the long run, a contractionary monetary policy rate (MOPR) significantly reduces manufacturing output, confirming the sensitivity of the real sector to policy-induced cost of capital. Conversely, increases in broad money supply (BM2) and domestic investment (DINV) enhance manufacturing productivity, underscoring the relevance of financial liquidity and capital formation. Interestingly, lending interest rate (LNIR) exerts a positive influence on output, likely due to sector-specific structural factors. Additionally, exchange rate depreciation (EXRT) supports manufacturing growth, reflecting competitive advantages from import substitution. However, inflation (INFN) does not show a statistically significant long-run effect, reflecting inconclusive evidence in volatile macroeconomic environments. In the short run, the model highlights temporal effects: a lagged policy rate increase positively affects output, indicating a delayed monetary transmission. The negative short-run effect of lagged exchange rate shocks suggests rising input costs before competitive gains emerge. Short-run domestic investment (especially lagged) significantly boosts output, reinforcing the cumulative benefits of capital formation. The statistically significant error correction term (ECT) confirms a stable long-run relationship, with moderate speed of adjustment (17.5%) towards equilibrium after-shocks.

Policy Implications

Firstly, the negative long-run impact of the monetary policy rate on manufacturing output calls for a cautious approach to interest rate hikes. Hence, the Central Bank of Nigeria (CBN) should adopt a balanced monetary stance that controls inflation while avoiding excessive tightening of liquidity in the manufacturing sector. In this regard, targeted credit support and differential interest rates for industrial firms may help mitigate the adverse effects of high policy rates. Secondly, the positive role of broad money supply (BM2) suggests that maintaining adequate liquidity in the economy supports industrial activity. Therefore, policymakers should strengthen monetary transmission mechanisms so that increased liquidity translates into accessible credit for productive investments, particularly for SMEs in the manufacturing sector.

Moreover, the unexpected positive coefficient on the lending interest rate (LNIR) implies structural distortions in credit allocation. This, in turn, indicates the need for reforms in Nigeria's financial intermediation system. Specifically, efforts should focus on reducing credit rationing, enhancing access to affordable finance, and supporting targeted lending to high-potential manufacturing sub-sectors. In addition, the beneficial long-run impact of a depreciated exchange rate on manufacturing output supports policies that favor a competitive exchange rate regime. Nonetheless, to cushion the short-run negative effects such as the rising cost of imported inputs the government should invest in local sourcing of raw materials and provide infrastructure that supports backward integration in key industries.

Furthermore, the significance of domestic investment (DINV) highlights the need to stimulate local capital formation through fiscal incentives, tax reliefs, and public-private partnerships (PPPs). Equally important, government efforts to improve infrastructure, the ease of doing business, and macroeconomic stability will further attract private sector investment into the manufacturing sector. Conversely, given the insignificant impact of inflation on manufacturing output, a singular focus on inflation targeting may not yield optimal results. As such, a more

holistic macroeconomic framework incorporating fiscal discipline, exchange rate stability, and productive investment is needed to stabilize prices while simultaneously fostering industrial growth.

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