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# IMPACT OF EXCHANGE RATE ON MANUFACTURING SECTOR PERFORMANCE IN NIGERIA

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**Abstract**
The manufacturing sector plays a catalytic role in modern economies, offering dynamic benefits essential for economic transformation. However, in Nigeria, its performance remains relatively low compared to other regions, resulting in limited contributions to employment and output. This underperformance is largely attributed to political, social, and economic instability. The study examines the impact of exchange rate on key manufacturing sector performance indicators, specifically output growth and employment in Nigeria. Using the Auto-Regressive Distributed Lag (ARDL) model, the study identifies both long-run and short-run relationships among the variables. Data was obtained from the CBN Statistical Bulletin (2022) and World Bank Indicators (2022), and the analysis incorporated the Marshall-Lerner condition and the J-curve effect. Findings reveal that the real exchange rate has a long-run relationship with manufacturing output growth. However, both real exchange rate depreciation and inflation negatively affect manufacturing output and employment. In contrast, gross fixed capital formation (GFCF), labour force, balance of trade, and foreign direct investment (FDI) significantly and positively impact output growth in the long run. The study recommends targeted policies to stimulate manufacturing output in response to currency depreciation. For sustainable growth, policymakers should prioritize exchange rate and inflation stability, alongside investments in infrastructure, skilled labour, and FDI incentives. These measures are crucial to boosting productivity, enhancing competitiveness, and promoting inclusive economic growth and poverty reduction in Nigeria.

**Keywords:** Exchange rate, Manufacturing sector, Output, Employment, Nigeria

**JEL Classification Codes**: F31, F32, L60

## 1.0 Introduction

A profitable and effective manufacturing sector is a life wire to any nation's sustainable economic growth and development. This is because manufacturing sector is a catalyst for structural transformation, engine of economic growth and development, and assumed to be more dynamic than other sectors (Banjoko, Iwuji & Bagshaw, 2012). Loto, (2012) refers manufacturing sector as an avenue for increasing productivity in relation to import replacement and export expansion, creating foreign exchange earning capacity, raising

employment and per capita income which causes unrepeated consumption pattern. It comprises units engaged in the physical or chemical transformation of materials, substances, or components into new products (International Standard Industrial Classification). Of all the components of industrial sector such as manufacturing, mining, construction, electricity and water and gas, manufacturing sector is the most dynamic part (Szirmai, 2009). Manufacturing sector, like other industrial activities, creates avenues for employment, help boost GDP, help to diversify the economy, while helping the nation to increase its foreign exchange earnings. In addition, it helps enable local labour to acquire skills. Furthermore, minimizes the risk of overdependence on foreign trade and leads to the fullest utilization of available resources. It is one of the key elements of a development strategy in developing countries (Stiglitz, 2018).

Manufacturing sector can move a country from consumption economy to production. Despite evidences with respect to Asian Tigers that manufacturing sector precipitates industrialization, it is the opposite in Nigeria where manufacturing sector performance has continued to decline steadily and the economy is import-driven in nature.

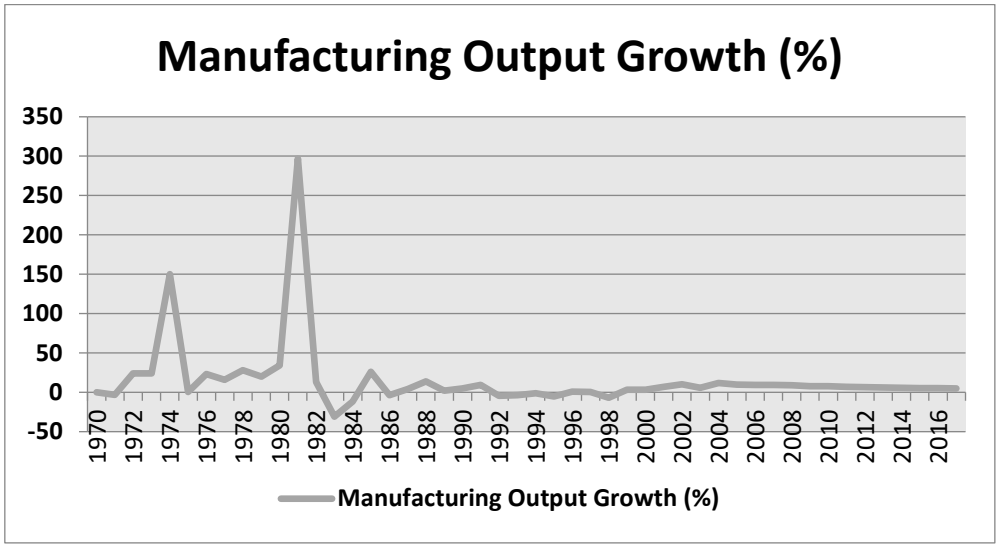


**Figure 2.1: Manufacturing Output Growth in Nigeria (1970-2017)**

**Source:** World Development Indicators (2018)

Performance in the manufacturing sector is a broad term that includes thoughts or analysis of the expansion of the industry, as well as the success or failure rate of certain performance metrics. Because it creates jobs, income, and encourages exports and foreign exchange earnings, the manufacturing sector's performance is a vital component of economic transformation and development in all economies. Strong manufacturing sector

performance is desired for the nation, as it is linked to increased output, highly value-chained products, stronger economic ties, a larger pool of employment, rising earnings, and expanding export diversification. In Nigeria, however, the sector's performance has been constrained by macroeconomic instabilities. Manufacturing output growth has been erratic over the years, affected by persistent inflation, which raises input costs, reduces consumer purchasing power, and hinders long-term investment decisions. The employment rate in the sector has also been unstable, as high operating costs and infrastructure deficits limit expansion and job creation. Exchange rate volatility remains a critical challenge, as fluctuations in the naira increase the cost of importing raw materials and machinery, thereby reducing productivity and global competitiveness. Meanwhile, foreign direct investment (FDI) inflows into manufacturing have been limited by policy uncertainties, though FDI remains essential for technology transfer and capital formation. Trade balance issues and limited external reserves have further complicated sectoral growth. Nigeria's manufacturing industry, made up of large, medium, small, and micro businesses (CBN, 2013), spans a wide range of activities including mining, oil and gas exploration and production, petroleum refining, chemical and pharmaceutical production, food processing, agriculture, electronics, and home appliances (SDIG, 1996) making its revival and sustainability central to broader economic development goals.

Exchange rate plays an increasingly significant role in any economy as it directly affects domestic price level, profitability of traded goods and services, allocation of resources and investment decision. Exchange rate is one of the actor players of macroeconomic variables used to determine the international competitiveness and it is considered as a measure of how competitive the currency of a country is (Rasaq, 2013). Exchange rate indicates the values of one currency in terms of another. It is the price of one currency in terms of another currency. Traditionally, exchange rate is defined as the price of one unit of the foreign currency in terms of the domestic currency (Adeniyi & Olasunkanmi, 2019). It is a determinant of relative prices of domestic and foreign goods and also determines the strength of external sector participation in the international trade. Exchange rate remains a veritable tool in the growth of an economy as its stability is very germane in stimulating export and private investment. Evan and Lyons (2005) described exchange rate is an important economic indicator that has a strategic role in an economy and say that exchange rate movements widely influence various aspects of the economy, including inflation, import-export performance which in turn affects the

output of economy. They conclude that in the market, there are two main forces that interact with each other, namely supply and demand and they form an equilibrium which is reflected in the price and quantity levels where supply and demand curves meet.

The data evidence above for the manufacturing sector performance indicators in Nigeria have been a nightmare. Manufacturing sector output from 1970 till date recorded insignificant contributions to GDP (World Bank 2020) which probably may be driven by many factors including import, investment, human capital, energy consumption, credit to the private sector and nominal exchange rate (CBN, 2013; Adekoya. 2018). Capacity utilization shows that manufacturing sub-sectors are characterized by sub-optimal levels of production and has been nose-diving in Nigeria that is, capacity is grossly underutilized in virtually every productive firm in Nigeria (Okunade, 2018). Being a major determinant of manufacturing output in a country, low manufacturing capacity utilization appears to be likely one of the causes of dwindling manufacturing sector performance in Nigeria and is associated to drivers such as energy, exchange rate, interest rate, trade openness, inflation, business climate, institutional factors and policy (Okoye & Nwakoby, 2015; Okunade, 2018). Notwithstanding, low manufacturing share also accounts in terms of manufacturing value added (MVAD), and data evidence show that MVAD has been consistently low, below 10% in Nigeria from 1970 to 2019 (World Bank 2020). It does appear that the Nigeria's manufacturing sector has long been suffering from weak value chain which could be attributed to many factors including limited domestic credit to private sector, fixed capital formation, human infrastructure, trade openness, FDI stock (as % of GDP), among others. Another major issue has to do with employment in terms of human capital. Nigeria appears to be one of the worst, globally, in terms of building human infrastructure (Abati, 2022).

In many economies, the performance of the Industrial Sector is the gauge for assessing the effectiveness of macroeconomic policies. Government policies; particularly exchange rate policies can only be deemed successful if they impact positively on the production and distribution of goods and services. A vibrant and productive Industrial arm of the economy creates more linkages in the economy and promotes internal and external balance. Variation in exchange rate is an important endogenous factor that affects economic performance, due to its impact on macroeconomic variables like outputs, imports, export, prices, interest rate and inflation rate. A sound and appropriate exchange rate policy is crucial condition for

improving economic performance (Chang & Tan, 2008). In practice, however, no exchange rate is pure float or completely determined by market forces. Rather, the prevailing system is the managed float type, whereby there is periodic intervention by monetary authorities in the foreign exchange market to attain strategic objectives (Mordi, 2006). A managed floating exchange rate regime has been the most predominant in Nigeria since the introduction of Structural Adjustment Programme in 1986.

**Statement of the Problem**

The manufacturing sector plays catalytic role in a modern economy and has many dynamic benefits that are crucial for economic transformation. In an advanced country, the manufacturing sector is a leading sector in many respects. It is an avenue for increasing productivity in relation to import substitution and export expansion, creating foreign exchange earning capacity, raising employment, promoting the growth of investment at a faster rate than any other sector of the economy, as well as wider and more efficient linkage among different sectors (Fakiyesi, 2005).

Available statistics from World Bank and CBN confirmed to a continuous decline in the manufacturing sector performance indicators in Nigeria which apparently may be due to byproduct of diverse factors including import, lack of strategic investments, epileptic electricity/power supply, high exchange rate, high interest rate, increased openness, poor wage rate, unfavourable terms of trade, etc. (Adeyemi & Olufemi, 2016; Anyanwu, 2017). Regardless of all past governments' efforts in tackling these problems, it does appeared that the manufacturing sector performance has failed to respond to virtually all known economic reform packages such as import substitution industrialization (ISI), export promotion strategy (EPI), development plans, structural adjustment programme (SAP), Nigerian economic empowerment development (NEEDs), 7-Point Agenda, Nigeria industrial revolution plan (NIRP) etc, and show no demonstrable improvement in the country's manufacturing sector performance indicators in respect to output growth, capacity utilization, value added, employment rate, and export. This, however, cast serious doubt on the country's ability to achieve economic transformation agenda and economic recovery growth plan directed towards robust manufacturing sector growth and reducing importation in Nigeria.

Generally, scholars have documented that the transmission of exchange rate influence the economy through the effect of the shock, short and long-run effects (Hunegnaw, 2017). This study contributed to the existing literature in two-fold. Firstly, by adopting a linear ARDL equation model decomposing the impact of exchange rate volatility on both

manufacturing sector output and manufacturing sector employment in Nigeria. Secondly, by using the ARDL and Canonical Co-integrating Regression (CCR) to investigate the effect of short and long-run elasticities of exchange rate on manufacturing sector indicators. Thus, the general objective of the study is to examine the impact of exchange rate on manufacturing sector performance indicators in Nigeria.

## 2.0 Literature Review

### 2.1 Conceptual Literature Review

#### A. Manufacturing Sector Performances

The process of manufacturing entails transforming raw materials into final consumer, intermediate, or producer items. The process of converting raw materials into (a) consumer goods, (b) new capital goods that enable the production of more consumer goods (including food) with the same human resources, and (c) social overhead capital that, when combined with human resources, provide new services to both individuals and businesses, is another way to define manufacturing (Ekpo, 2018). It is impossible to overstate the significance of the manufacturing industry. Similar to other industrial endeavours, manufacturing generates employment opportunities, contributes to GDP growth, broadens the economic base, and enhances the country's foreign exchange revenues. It also facilitates the skill-building of local labour (Hunegnaw, 2017).

#### B. Manufacturing Sector Output Growth

Manufacturing sector output growth refers to the increase in the total value of goods produced by the manufacturing industry within a specific time period, typically measured quarterly or annually Dhasmana (2015). This growth is an important economic indicator as it reflects the health and performance of the manufacturing sector within a country or region. Several factors contribute to manufacturing sector output growth. Example is Increased Demand- When there is a rise in consumer demand for goods, it leads to an increase in production to meet that demand. This can be due to factors such as population growth, rising incomes, or changes in consumer preferences.

#### C. Manufacturing Sector Employment

The manufacturing sector comprises of industries involved in the production of goods through various processes, such as raw material processing, assembly, and fabrication. Employment in the manufacturing sector refers to the workforce engaged in these activities. Here are some key aspects of manufacturing sector employment: Production Workers: These are the front-line workers involved in the actual manufacturing process. They operate machinery, assemble products, and perform other tasks related to production. Supervisors and Managers: They

oversee production processes, manage workers, and ensure that production targets are met efficiently (Abdul-Mumuni 2016).

**D. Exchange rate**

Exchange rate has been defined as the price of one currency in terms of another (Mordi, 2006). Fahrettin (2001) asserted that an exchange rate, as a price of one country's money in terms of another's, is among the most important prices in an open economy. It influences the flow of goods, services, and capital in a country, and exerts strong pressure on the balance of payments, inflation and other macroeconomic variables. Therefore, the choice and management of an exchange rate regime is a critical aspect of economic management to safeguard competitiveness, macroeconomic stability, and growth. Furthermore, Hossain (2002) agreed that exchange rate helps to connect the price systems of two different countries by making it possible for international trade and also effects on the volume of imports and exports, as well as country's balance of payments position.

**2.2 Review of Basic Theories**

The following theories are discussed to reflect the effect of exchange rate on manufacturing sector performance in the Nigerian economy.

**A. Marshall-Lerner Condition**

The Marshall-Lerner Condition, developed independently by Alfred Marshall and Abba Lerner in the early 1920s, provides a theoretical basis for evaluating the effectiveness of currency devaluation in improving a country's trade balance. The theory assumes that both exports and imports are responsive to changes in relative prices caused by exchange rate movements, and that markets tend to adjust gradually over time rather than instantaneously. It posits that a depreciation of the domestic currency will only lead to an improvement in the trade balance if the sum of the absolute values of the price elasticities of demand for exports and imports is greater than one. In the Nigerian context, where the manufacturing sector heavily depends on imported intermediate goods and capital equipment, the assumptions of elastic demand become critical. If the demand for Nigeria's manufactured exports is not sufficiently responsive to lower prices, or if local manufacturers cannot easily reduce import dependency due to technological or structural limitations, then depreciation may not enhance sectoral performance.

The relevance of this theory to the subject matter lies in its ability to explain the conditions under which exchange rate adjustments might positively impact Nigeria's manufacturing sector. Given that Nigeria has persistently relied on import-intensive manufacturing processes, understanding the elasticity of trade is crucial for assessing whether devaluation policies can truly stimulate growth in the sector. The

Marshall-Lerner Condition helps clarify why exchange rate depreciation alone may not be sufficient unless combined with efforts to boost competitiveness and domestic capacity in manufacturing.

**B. J-Curve Effect**

The J-Curve Effect, introduced by Stephen Magee in the 1970s, builds upon the Marshall-Lerner Condition to explain the dynamic adjustment process of a country's trade balance following currency devaluation. It is grounded in the assumption that prices and trade volumes respond with a time lag to changes in the exchange rate due to contractual obligations, inelastic short-run demand, and slow behavioural adjustment in international markets. Initially, depreciation may worsen the trade balance because the value of imports increases immediately, while the quantity of exports takes time to rise in response to enhanced price competitiveness. Over time, however, as foreign demand reacts to lower prices and domestic consumers shift away from costlier imports, the trade balance begins to improve, creating a curve that resembles the shape of a "J." In relation to Nigeria's manufacturing sector, this theory explains why devaluation may initially hurt performance by raising the cost of imported raw materials and machinery. Nevertheless, if structural reforms are implemented and the manufacturing sector becomes more export-oriented and efficient, long-run benefits may emerge.

The J-Curve Effect is relevant to this study as it provides a time-based framework for understanding the delayed effects of exchange rate changes on Nigeria's manufacturing output. While short-term depreciation might appear detrimental, especially for a sector that is highly import-dependent, the theory justifies the need for patience and complementary reforms. It emphasizes that the observed lag in manufacturing sector response to exchange rate changes is not necessarily a policy failure but could be an expected phase in the adjustment path, thus offering policymakers realistic expectations about the timing and sequencing of outcomes.

## 2.3 Review of Empirical Literature

**A. Exchange rate and Manufacturing Sector Output Growth**

Ehinohem and Oladipo (2012) conducted studies on the relationship between exchange rate and manufacturing performance in Nigeria between 1986 and 2010. They found that exchange rate appreciation had a significant impact on domestic output, while inflation had a positive effect. The study suggested that the Nigerian government should focus on subsidizing the manufacturing sector to mitigate the negative effects of exchange rate movement. Dhasmana (2015) found that real exchange rate changes significantly impacted Indian manufacturing firms' performance, depending on factors like market power, trade

orientation, foreign ownership, access to domestic finance, and industry concentration. The study emphasizes the need for considering firm and industry level heterogeneity in designing policies to manage exchange rate shocks and financial development in currency risk management.

Abdul-Mumuni (2016) studied the impact of exchange rate variability on manufacturing sector performance in Ghana, using time series data from 1986-2013. The study found that as the exchange rate appreciated, the manufacturing sector performance improved, while as it depreciated, it was adversely affected. To improve the performance of the manufacturing sector, policy should be put in place to regulate the importation of locally produced goods and ensure regular electricity supply, good roads, water, and a reliable telecommunication system. Okafor, Adegbite, and Abiola (2018) investigated the effects of exchange rate fluctuation, inflation, and industrial output in Nigeria from 1981Q1 to 2015Q4. The study found that a positive shock to an exchange rate has a negative impact on output growth, while a positive shock to inflation has a temporal negative effect on output and becomes positive after the fourth quarter. The response of industrial output to the shock from the exchange rate was positive and significant, more specifically in the initial years.

Buabeng, Ayesu, and Adabor, (2019) examined the effect of exchange rate fluctuations on the performance of manufacturing firms in Ghana for the period 1990 to 2018. The study used the bounds test approach to cointegration within the framework of autoregressive distributed lags model as the estimation strategy. The results revealed that exchange rate and monetary policy rate have a negative and significant relationship with manufacturing firm performance. Ayobami (2019) examined the effect of exchange rate movement and exchange rate volatility on the performance of manufacturing firms in Nigeria from 1985 to 2019. The results showed that appreciation of Nigerian domestic currency has a significant positive effect on Nigerian manufacturing performance, while exchange rate volatility has a significant negative effect on Nigerian manufacturing output. Orji and Ezeanyaeji (2022) examined the impact of exchange rates on the performance of the manufacturing sector in Nigeria between 1990 and 2020. The study concluded that exchange rate devaluation constrains the manufacturing sector while exchange rate fluctuation hampers its output.

### B. Exchange rate and Manufacturing Sector Employment

The study by Mensah, Awunyo-Vitor, and Asare-Menako (2013) found that exchange rate volatility significantly impacts

employment growth in Ghana's manufacturing sector. The devaluation of the Ghanaian cedi against the U.S. dollar negatively impacted Ghana's economic growth. The study also found that interest rates are averse to employment growth in Ghana's manufacturing sector, while GDP shows a positive correlation with employment growth. However, the authors mistakenly used exchange rate fluctuations measurement for volatility measurement, which may have been unfounded. The study also found that employment positively responds to the depreciation of effective and bilateral exchange rates vis-à-vis the Euro and US dollar. The study also found that real exchange rate volatility has a significant contractionary effect on manufacturing employment growth.

Zmami and Salha (2015) studied the impact of exchange rates on manufacturing employment in Tunisian and South African economies. They found that employment positively responds to the depreciation of effective and bilateral exchange rates compared to the Euro and US dollar. The elasticities of employment to exchange rates vary based on firm characteristics, such as ownership structure, international exposure, size, and industry. Mpofu and Eftychia (2018) found that real exchange rate volatility has a significant contractionary effect on manufacturing employment growth. Factors such as manufacturing output, wages, exports, and the level of real effective exchange rate and long-term interest rates also significantly impact manufacturing employment growth.

### 2.4 Summary of Literature Reviewed and Justification of the Study

This study investigates the impact of exchange rate fluctuations on the performance of the manufacturing sector in Nigeria, using selected indicators of manufacturing output as dependent variables and exchange rate as the main independent variable. The theoretical underpinning of the study draws on the Marshall-Lerner Condition and the J-Curve Effect, both of which provide important insights into how currency depreciation influences trade balances and manufacturing outcomes over time. The Marshall-Lerner Condition posits that devaluation can improve a country's trade balance if the sum of the price elasticities of exports and imports exceeds one, while the J-Curve Effect emphasizes the time-lagged nature of these improvements, suggesting that initial deterioration may precede long-run gains.

Empirical studies in the literature have produced mixed evidence on the relationship between exchange rate volatility and the performance of the manufacturing sector. Some findings support a positive long-term relationship, while others emphasize the negative short-term effects, particularly in economies with high import dependence and

weak industrial infrastructure features characteristic of the Nigerian economy. This study builds upon and extends these earlier works by focusing specifically on performance indicators within Nigeria's manufacturing sector, such as output growth, employment generation, and capacity utilization, over a longer period (1981–2022). The study employs the ARDL modelling technique to capture both the short-run and long-run dynamics of the exchange rate-manufacturing performance relationship. This dual focus helps uncover the delayed but potentially positive impact of exchange rate policies on the sector, as suggested by the J-Curve theory. The analysis contributes to existing research by modifying previous models to better reflect Nigeria's structural economic features and by including recent data to capture post-reform and post-crisis realities. Overall, this study provides a timely and policy-relevant contribution by clarifying how exchange rate dynamics affect one of Nigeria's most critical sectors. The findings are expected to inform the design of more effective exchange rate and industrial policies, aimed at stimulating sustainable manufacturing sector growth and supporting broader economic development goals.

## 3.0 Methodology

### 3.1 Theoretical Framework

This study adopts the J-Curve Effect as its theoretical framework, which is particularly relevant in analysing the relationship between exchange rate fluctuations and the performance of the manufacturing sector. The J-Curve Effect, rooted in the broader field of international economics, explains how a currency depreciation impacts a country's trade balance in the short run and long run. In the short term, a currency depreciation typically worsens the trade balance because the prices of imports rise before the volume of exports increases. However, in the long term, as the effects of depreciation lead to a rise in export demand, the trade balance improves, eventually forming a "J" shape when plotted over time.

This theory is crucial in understanding how exchange rate volatility can affect the competitiveness of the manufacturing sector. Depreciation may initially increase the cost of imported materials and machinery, causing a temporary reduction in manufacturing output and performance. However, as the sector adjusts and increases export production, its performance may improve, reflecting the long-term benefits of a more competitive exchange rate.

In the context of the current study, the J-Curve Effect provides a framework for understanding how exchange rate changes influence the manufacturing sector's performance, as it interacts with factors such as production costs, demand for manufactured goods, and export dynamics. The Marshall-

Lerner Condition, which is often associated with the J-Curve, posits that for a currency depreciation to improve the trade balance, the sum of the price elasticities of demand for exports and imports must be greater than one. This condition is also considered in the study to capture the responsiveness of trade volumes to exchange rate changes, further enriching the analysis of the manufacturing sector's performance in response to exchange rate movements.

### 3.2 Empirical Model Specification

The model for the study is specified in Equations (3.1) and (3.2)

$$MSOG = f(REXCH, CPI, GFCF, ELF, BOT\ FDI) \quad (3.1)$$

$$MSE = f(REXCH, CPI, GFCF, ELF, BOT\ FDI) \quad (3.2)$$

Equation (3.1) and (3.2) implies manufacturing sector output growth and manufacturing sector employment are the function of real exchange rate, inflation rate, gross fixed capital formation and effective labour force, while balance of trade and foreign direct investment were added in the model as control variables. By building an econometric model of the functional model above, the model is specified thus:

$$MSOG = \beta_0 + \beta_1 REXCH + \beta_2 CPI + \beta_3 GFCF + \beta_4 ELF + \beta_5 BOT + \beta_6 FDI + \mu_1 \quad (3.3)$$

$$MSE = \beta_0 + \beta_1 REXCH + \beta_2 CPI + \beta_3 GFCF + \beta_4 ELF + \beta_5 BOT + \beta_6 FDI + \mu_2 \quad (3.4)$$

Where; MSOG = Manufacturing sector output growth, MSE = Manufacturing sector employment, REXCH = Real exchange rate, CPI = Consumer price index (proxy for inflation), GFCF = Gross fixed capital formation proxy for domestic investment, ELF = Effective labour force proxied by the population growth rate, BOT = Balance of trade, FDI = Foreign direct investment, $\mu$ = Disturbance term/error term, $\beta_0$ = Constant term, $\beta_1$ $\beta_2$ $\beta_3$ $\beta_4$ $\beta_5$ are parameters to be estimate

**Apriori Expectation**

Based on theories and empirical studies, we expect the predictor variables such as real exchange rate, inflation rate are expected to have a negative relationship with both manufacturing sector output growth and performance while GFCF, ELF, BOT and FDI are expected to have a positive relationship with the dependent variable.

Therefore, mathematically states as:

**REXCH/MSOG,MSE < 0, CPI/MSOG,MSE < 0, GFCF/MSOG,MSE > 0, ELF/ MSOG,MSE> 0, BOT/MSOG,MSE > 0, FDI/MSOG,MSE > 0.**

The above signifies a positive and negative relationship and movement of exogenous variables on manufacturing sector output.

### 3.3 Estimation Technique and Procedures

The models of this study were estimated using the VAR and auto-redistributed lag model. VAR models are used widely in business cycle analysis to estimate the output gap because they combine together a robust statistical framework with the ability of integrating alternative economic constraints. Regardless, the direct use of ARDL without accounting for the descriptive and time-series properties of the relevant data may result in spurious regression. It is widely known that meaningful economic policy can barely be generated from an OLS regression involving data misalignment and non-stationary time series. As a result, unit root test, co-integration test, and possible estimation of error correction models are required.

### Unit Root Test

In order to prevent the problem of false regressions, the time series features of the data used in the estimate equation are evaluated for stationarity using the Augmented-Dick-fuller (ADF) unit root test. The augmented Dickey Fuller test, which was used to test for data stationarity at 1%, 5%, and 10% critical values, will be utilized to conduct the unit root test. The existence of unit root is H0, and the absence of unit root is H1.

### Co-integration Test

Johansen cointegration testing was employed to investigate whether there is existence of long run relationship among the variables in estimation and error correction mechanism is employed to ascertain the speed of adjustment from the short term run equilibrium to the long-run equilibrium state.

### Auto Redistributed Lag Model

The ARDL model is used in the bound test of Pesaran, Shin and Smith (2001), thus enabling the analysis of short and long-term relationships without requiring the series in the model to be stationary. This approach allows the conduct of a cointegration analysis regardless of whether the variables are I (0) and I (1). The model firstly established the unrestricted error correction model. Thus, the F test is applied on the lags of dependent and independent variables for the purpose of testing the presence of cointegration relationship. The test statistics included into the model are based on the Wald or F test which expresses common significance. However, the variables should not have an integration level which is I (2) or higher (Özmen and Koçak, 2012).

## 4.0 Data Presentation and Discussion

### 4.1 Stationarity Test

The ADF results comprising of the t- statistics and 5% critical value as originally generated are represented in Table 4.1.

**Table 4.1: Unit root (ADF test)**

| Variables | Adf test at level | Adf test at 1st Difference | 5% critical values | Order of integration | Remarks |
|---|---|---|---|---|---|
| **MSOG** | -2.310560 | -4.850123 | 3.540328 | I (1) | Stationary |
| **MSEM** | -5.967088 | | -3.526609 | I (0) | Stationary |
| **REXCH** | 0.922502 | -4.387804 | -3.529758 | I (1) | Stationary |
| **CPI** | -3.938948 | | -3.529758 | I (0) | Stationary |
| **GFCF** | -1.665249 | -5.268942 | -3.529758 | I (1) | Stationary |
| **ELF** | -1.364377 | -4.363286 | -3.562882 | I (1) | Stationary |
| **BOT** | -2.818390 | -5.828799 | -3.533083 | I (1) | Stationary |
| **FDI** | -3.978200 | | -3.526609 | I (0) | Stationary |

**Source: Authors' Computation Using Eviews 12**

Decision Rule: Reject $H_0$ if ADF test value is greater than 5% critical value, otherwise accept. From the above result, at first difference, the ADF test value of MSOG, REXCH, GFCF, ELF as well as BOT are greater than their critical values at 5% respectively. Therefore, we reject $H_0$ of MSOG, REXCH, GFCF, ELF and BOT and then conclude that they are stationary at first difference. Also, the ADF test value of MSEM, CPI and FDI are greater than their critical values at 5% respectively. Therefore, we reject $H_0$ of MSEM, CPI and FDI and then conclude that they are stationary at level form. This implies that the variables of the model are integrated of order zeros and one.

### 4.2 Test for Co-integration

Given that the series are integrated of order zero and one that is 1(0) and 1(1), auto redistributed lag Bound cointegration approach is found worthy in ascertaining if there is a long run relationship exist between the variables of the model.

| **Table 4.2: ARDL Bounds Test for Model 1** | | |
|---|---|---|
| **F-Statistics = 12.44557** | | |
| **Critical Value Bounds** | | |
| **Significance levels** | **I(0) Bounds** | **I(1) Bounds** |
| **10%** | 2.12 | 3.23 |
| **5%** | 2.45 | 3.61 |

**Source: Authors' Computation Using Eviews 12**

Model one result verifies that there is evidence of cointegration among the variables. This is due to the fact that the F-Statistics value (12.44557) is greater than the lower and upper critical bounds for all the significant levels. This led to the rejection of null hypothesis of no co-integration and the result is summarized and presented in Table 4.2.

| **Table 4.3: ARDL Bounds Test for Model 2** | | |
|---|---|---|
| **F-Statistics = 2.338336** | | |
| **Critical Value Bounds** | | |
| **Significance levels** | **I(0) Bounds** | **I(1) Bounds** |
| **10%** | 2.12 | 3.23 |
| **5%** | 2.45 | 3.61 |

**Source: Authors' Computation Using Eviews 12**

Model two results verify that there is no evidence of cointegration among the variables. This is due to the fact that the F-Statistics value (2.33833) is less than the lower and upper critical bounds for all the significant levels. This led to the acceptance of null hypothesis of no co-integration and the result is summarized and presented in Table 4.3.

### 4.3 Evaluation of Estimates

The satisfactory results obtained from the unit root and co integration tests motivated the estimation. The ordinary least square (OLS) regression result of this study is presented in Table 4.4.

**Table 4.4 ARDL Long Run Result (Model 1)**

| **Dependent Variable: MSOG** | | | | |
|---|---|---|---|---|
| **Variable** | Coefficient | Std. Error | t-Statistic | Prob. |
| **REXCH** | -212.435907 | 27.760237 | -7.652525 | 0.0167 |
| **CPI** | -1064.976224 | 50.805351 | -20.961891 | 0.0023 |
| **GFCF** | 347.667117 | 125.713146 | 2.765559 | 0.0097 |
| **ELF** | 0.003872 | 0.000413 | 9.377811 | 0.0112 |
| **BOT** | 619.476502 | 90.422125 | 6.850939 | 0.0206 |
| **FDI** | 18212.6745 | 1338.064338 | 13.611166 | 0.0054 |
| **C** | -103262.868 | 17672.617449 | -5.843076 | 0.0281 |
| **CointEq(-1)** | -0.990325 | 0.296586 | -3.339082 | 0.0792 |
| **R-squared 0.998** | Adjusted R2 0.980 | F-statistic 54.25 | Prob(F-stat) 0.008 | D.W 1.840 |

**Source: Authors' Computation Using Eviews 12**

The coefficient of the constant implies that if REXCH, CPI, GFCF, ELF, BOT as well as FDI are set equals to zero, manufacturing sector output growth (MSOG) decreases by about 103262.68 percent point. The long run coefficient of REXCH is -212.43, which implies that with the influence of all other variables held constant, an increase in the real exchange rate in the long run by one percent on the average, will lead to a decrease in the manufacturing sector output growth by about 212.43 Percent point. The long run coefficient

of inflation is -1064.97, this suggest that all things being equal, as inflation increases by one percent on the average, manufacturing sector output growth decrease by about 1064.97 percent point. The long-run coefficient of GFCF is 347.66, suggesting that an increase in GFCF leads to an increase in MSOG by about 347.66 percent. The long-run coefficient of BOT is 619.74, suggesting that an increase in BOT will lead to an increase in MSOG by about 619.74 percent. The long-run coefficient of FDI is 18212.70, suggesting that a 1% increase in FDI will lead to an increase in MSOG by about 18212.70 percent. The R-squared indicates that about 99% of the change in MSOG is explained by changes in independent variables

**Table 4.5 ARDL Short Run Result (Model 2)**

**Dependent Variable: MSEM**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| **D(REXCH)** | -0.002401 | 0.001065 | -2.260532 | 0.0503 |
| **D(CPI)** | -0.000408 | 0.000109 | -2.107224 | 0.9181 |
| **D(GFCF)** | 0.001284 | 0.000543 | 2.077128 | 0.0410 |
| **D(ELF)** | -0.000000 | 0.000000 | -1.461595 | 0.1942 |
| **D(BOT(-1))** | 0.004269 | 0.012919 | 0.330440 | 0.7523 |
| **D(FDI(-2))** | -0.057033 | 0.034476 | -1.654269 | 0.1492 |
| **CointEq(-1)** | -0.633496 | 0.270041 | -2.344885 | 0.0273 |
| **R2 0.905** | Ad-R2 0.815 | F-stat 22.233 | Prob(F-stat) 0.002 | D.W 1.98 |

**Source: Authors' Computation Using Eviews 12**

The result on Table 4.5 shows that a short run volatility in exchange rate led to about 10.05 percent decrease in manufacturing sector employment MSEM. The result also shows that a unit increase in (REXCH, CPI, ELF, FDI) in Nigeria will decrease Nigeria's manufacturing sector employment by 0.002, percent 0.0004, percent 0.0001, percent 0.0057 percent respectively. While a unit increases in GFCF and BOT increase MSEM by 0.001 percent and 0.0042 percent respectively. On the other hand, the t-test statistics shows that REXCH, CPI, GFCF are statistically significant to MSEM, while FDI, BOT, and ELF are statistically insignificant to MSEM. The R-squared shows that about 90% change in MSEM is explained by changes in the independent variables such as REXCH, CPI, GFCF, ELF, BOT and FDI. Further the CointEq(-1) indicates that it will require about 63% changes for the dependent and independent variables to adjust to equilibrium in the short run.

Empirical result from Durbin-Watson (D-W) test shows that computed D-W for all models are 1.840 and 1.98 respectively. While the result from Durbin-Watson (D-W) tabulated lower case ($d_L$) is equals to 1.160 and 1.222, Durbin-Watson (D-W) tabulated upper case ($d_u$) is equals to 1.803 and 1.726 respectively. We take no decision on the models and conclude that there is no evidence of autocorrelation or no autocorrelation with a first order scheme in the specified models.

From the BPG test decision rule which states: reject $H_0$ if the calculated $\chi^2$ is greater than critical value of $\chi^2$ at chose level of significance and accept $H_0$ if stated otherwise or if Obs* R-squared of probability chi-square is less than 5%. From the result above, since the Obs* R square of probability chi-square of the models are 31.5%, 32.9% are greater than 5%. We therefore accept $H_0$ and conclude that the error terms specified in models are homoskedastic.

**F-Statistic Test**

**Table 4.6 Summary of the F-Statistics Test**

| | F-statistics | $F_{0.05}(6,39)$ | Decision Rule | Conclusion |
|---|---|---|---|---|
| **Model 1** | 54.25 | 5.75 | $F_{cal}>F_{tab}$. Reject $H_0$ | Statistically Significant |
| **Model 2** | 22.23 | 5.75 | $F_{cal}>F_{tab}$. Reject $H_0$ | Statistically Significant |

**Source: Authors' Computation Using Eviews 12**

Table 4.6 summarizes the significance of the overall regression. Since $F_{cal}$ = 54.25, 22.23 from both models are greater than the $F_{0.05}$ (6, 36) = 5.75, we reject $H_0$. Thus, we conclude that the slope coefficients are not simultaneously equal to zero; hence, there is a joint significance of the variables used in the models, which implies that there is a strong relationship between the regressed (MSOG, MSEM) and the regressors REXCH, CPI, GFCF, ELF, BOT as well as FDI.

### 4.4 Discussion of Findings

The study reveals that fluctuations in exchange rates negatively impact the Nigerian manufacturing sector's economic activities. Factors such as high foreign exchange costs, lack of financial capital, technological underdevelopment, inadequate socio-economic infrastructure, technical manpower shortage, and foreign domination affect the sector's performance. Despite the implementation of exchange rate devaluation, the sector has not performed better due to these factors. The inverse relationship between exchange rate fluctuations and the sector's performance is evident. The Nigerian manufacturing sector lacks high-level technological content and faces severe infrastructure problems, including power impediments and weak social infrastructure. The lack of feeder industries, which produce intermediate inputs and spare parts, further exacerbates the sector's performance. The

manufacturing sector in Nigeria is yet to significantly contribute to the economy, and steps are needed to satisfy national aspirations. The findings of this study are in consonance with the findings of Ehinomen (2013); Fapetu and Oloyede (2018); Ismaila (2016); Obadan (2006); Okafor et al. (2018) who found similar result. The findings of this study is also in line with Barguellil, Ben-Salha, and Zmami (2018); Franke (1991); Ogundipe et al. (2014); Oladipupo (2011) who found inverse relationship between an exchange rate fluctuations and manufacturing sector output growth in their country specific analysis.

Inflation has a significant impact on Nigeria's manufacturing sector, with high inflation rates reducing consumer purchasing power and increasing input costs. This can lead to reduced investment and production levels, resulting in higher unemployment rates and social and economic consequences. Inflation can also affect domestic manufacturers' competitiveness, causing a decline in market share for local industries. Additionally, high inflation rates can create uncertainty for businesses, making it difficult to plan for the future and make long-term investment decisions. Conversely, increased domestic investment in the manufacturing sector can lead to higher production and output, contributing to overall economic growth. A thriving manufacturing sector can diversify the economy, reduce dependence on volatile commodity prices, and provide employment opportunities, particularly in countries like Nigeria. The manufacturing sector offers higher wages, which can drive consumption and stimulate demand for other goods and services. As more people gain employment in the manufacturing sector, poverty levels may decrease, as a steady income allows individuals and families to meet their basic needs and improve their standard of living.

The balance of trade, Foreign Direct Investment (FDI), and the manufacturing sector output in Nigeria significantly impacts the country's economic development and stability. A positive balance of trade indicates that the economy is producing and selling more goods and services abroad than it is purchasing from foreign markets, leading to increased national income and economic growth. A thriving manufacturing sector, supported by FDI, creates job opportunities, reduces unemployment rates, and alleviates poverty. FDI often leads to technology transfers, knowledge spillovers, and the adoption of best practices, enhancing the efficiency and productivity of the manufacturing sector.

A long-term positive relationship between the labour force and manufacturing sector output in Nigeria has several implications for the country's economy, labour market, and overall development. Increased labour force

participation in the manufacturing sector can lead to higher levels of production and output, contributing to overall economic growth and development. A growing manufacturing sector can also provide more households with income, stimulate consumer spending, alleviate poverty, and reduce income inequality. Investments in education and training programs can be incentivized to develop the necessary skills and expertise.

## 5.0 Conclusion and Recommendations

This study has beamed searchlight on the macroeconomic implications of exchange rate on manufacturing sector performance in Nigeria between the periods of 1982 to 2022. In the study, variables such as manufacturing sector output growth and manufacturing sector employment are used to proxy manufacturing sector performance while exchange rate was used as the explanatory variable. In conducting this scientific enquiry, the empirical evidence obtained revealed, among other things, that exchange rate fluctuations had a negative and statistically significant impact on the manufacturing sector performance. To this end, we conclude that exchange rate fluctuation restricts the performance of the manufacturing sector in Nigeria and hence has a strong macroeconomic implication on the sector.

Sequel to the findings of the study, the study recommends the following; Given the negative impact of exchange rate on manufacturing sector output growth, efforts such as Stimulation of Manufacturing Output During Currency Depreciation, Favourable Exchange Rate Policy for Competitiveness and attracting foreign investment through stable exchange rates should be targeted at stimulating manufacturing output whenever there is depreciation of the domestic currency to stabilize the sector's performance. More so, the manufacturing sector employment can be encouraged to look inwards and source their inputs more from within the country. This can provide the needed impetus to galvanize the sector's performance and stabilize the performance of the overall economy in the long-term. Government should provide a favourable exchange rate to make Nigerian goods more competitive in the international market, boosting exports. This will increase demand for locally manufactured products can lead to an expansion in production, requiring additional labour. However, a stable or appreciating exchange rate may attract foreign investors to the manufacturing sector. This influx of foreign capital can result in the establishment of new manufacturing facilities, contributing to job creation. The findings of this study revealed a positive impact of effective labour force and manufacturing sector output growth. In relation to this, government should establish training programs and partnerships with educational institutions to enhance the skills of the labour force and also focus on technical

and vocational training to equip workers with the specific skills needed in the manufacturing sector.

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