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# AN EMPIRICAL INVESTIGATION ON EFFECT OF MANUFACTURING OUTPUT ON ECONOMIC GROWTH IN NIGERIA

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## ABSTRACT

*The study investigated the effect of Manufacturing Output on Economic Growth in Nigeria. The study employed ex-post annual time-series data. The Autoregressive Distributive Lag (ARDL) estimation technique was used to establish the long run relationship among the variables. The study found evidence of cointegration among the variables. The study shown that Manufacturing Output only has short and long-run effects on the Economic Growth. Findings of the study revealed that manufacturing sector output has a positive and strong effect on economic growth in Nigeria. This is in line with economic a priori expectation of economic theories. As manifested from the findings of this study recommended collaboration between the major stakeholders of the manufacturing industries so as to increase the performance of the manufacturing sector for rapid economic growth and development.*

## 1.0 Introduction

Manufacturing has long been recognized as a primary driver of economic growth and stability (Aminu, et al., 2022). It creates well-paying jobs, fosters technological innovation, and stimulates investments in downstream industries (Aniefiok, et al., 2024). The multiplier effect of manufacturing extends beyond direct economic contributions, creating a ripple effect that benefits local communities, generates tax revenues, and fuels overall economic prosperity. Manufacturing has the power to shape urban development and infrastructure (Chukwuedo, et al., 2024). Manufacturing growth presents an opportunity to address inequality and promote inclusive economic development. By creating jobs, stimulating small and medium-sized enterprises, and investing in workforce development, manufacturing can uplift marginalized communities and contribute to reducing income disparities (Lutengano & Mwangoka, 2023). The manufacturing sector plays a crucial role in driving societal progress. Through the production of goods, manufacturers contribute to improving the quality of life by providing access to essential products and services. From medical equipment that saves lives to sustainable energy solutions that combat climate change, manufacturing has a profound impact on society as a whole. Massive imports of finished goods and insufficient financial support for the manufacturing sector are the main causes of the sector's dismal performance which has finally led to a decline in the capacity utilization in the nation (Oniyide, & Ogunjinmi, 2021).

The underperformance of the manufacturing sector has constrained the growth of the Nigerian economy. Economic growth rate has dwindled from 8.52 percent by 1985 to

1.87 percent in 1995. It went up again to 7.01 as at 2005, highly driven by oil booms and debts forgiveness by the international agencies, the growth rate dropped significantly to 2.79 in 2015 and peaked to 3.52 in the fourth quarter of 2022 during the post covid recovery (National Bureau of Statistics Report, 2023). As of 2023 in the 4th quarter the growth rate had declined to 3.46 percent (National Bureau of Statistics, 2024). Nigeria's Economic growth also faces severe infrastructure deficits, including inadequate transportation networks, power shortages, underutilization of capacity as seen in the manufacturing industries, low government support and macroeconomic instability (Okeke, et al, 2025).

Data from the CBN annual statistical bulletin, (2022) revealed that in 1985, the manufacturing sector contribution to GDP was at a record high of 20.1 percent. This significant contribution deteriorated along with political instability and poor policies, in the following decades, to the year 2000, the manufacturing sector's contribution to growth has nosedived by approximately 11.7 percent, in 2019 the value was 6.03 percent this improved slightly to 6.45 percent as of 2010 and rose to a paltry 8.9 percent in the year 2020. The Manufacturing value added as a percentage of the GDP increased to 14 percent in 2022 (World Development Indicators, 2024). The Nigerian government have taken steps to improve the manufacturing sector, common among them is the implementation of various industrial development policies aimed at promoting the growth and competitiveness of the manufacturing sector such as tax breaks, duty exemptions, and investment promotion schemes to attract domestic and foreign investment in manufacturing activities, local content development initiatives, export promotion schemes implemented to support manufacturers in accessing international markets and expanding their export activities and, the establishment of industrial parks and special economic zones (Sallam, 2021). Unegbu, & Ugwunna, (2024) further opines that the declining in manufacturing growth as a share of the GDP in many developing countries occurred due to a shift of manufacturing activities to a few numbers of populous countries such as China.

Therefore, this study seeks to fill these gaps by extending the scope to cover some recent development in the country. As manufacturing sector have valuable significant effect on economic growth in every country, results vary from country to country, but in Nigeria, there is little attention paid to study the relationship between manufacturing sector and economic growth. These research gaps are what this study intends to fill by exploring and providing more empirical evidence on the effect of Nigerian manufacturing sector on her economic growth. The study is organized into five sections, namely introduction, review of literature, methodology, results and discussion of findings and conclusion and policy recommendation.

## 2.0 Literature Review

## 2.1 Conceptual Review

### 2.1.1 Manufacturing Sector

Manufacturing refers to the transformation of raw materials or components into finished goods using manual, mechanical, or chemical processes (Mazeli, et al, 2024). This process increases the economic value of materials, forming a core segment of industrial activity and contributing significantly to national income through Manufacturing Value Added (MVA) which is a common metric to gauge manufacturing's economic impact (Michael, 2022). In Nigeria, the sector comprises diverse sub-sectors such as food and beverages, cement, textile, chemicals, and automobile assembly (CBN, 2022), and plays a pivotal role in driving productivity, innovation, employment, and structural economic transformation.

### Economic Growth

Economic growth is one of the five main macroeconomic goals of a society. A country's economic performance can be measured by looking at the country's economic growth and development. The economic growth of a country is usually indicated by an increase in that country's gross domestic product, GDP. In other words, gross domestic product is an economic aggregate that reflects the value of a country's output. Thus, a country's GDP is the total monetary value of the goods and services produced by that country over a specific period of time. Jhingan (2002) defined economic growth as a process in which the real per capita income for a country increases over a long period of time. He states that economic growth is measured by increase in the amount of goods and services in each successive time period. Thus, economic growth occurs when an economy's productive capacity increases which in turns is used to produce more goods and services.

### Capacity Utilisation of Manufacturing Sector

Capacity utilization measures the extent to which installed productive capacity is used to meet production targets, serving as a key indicator of efficiency and industrial productivity (Okeke, et al, 2025). High-capacity utilization indicates effective use of resources, while low rates signal underperformance and systemic inefficiencies. In Nigeria, factors such as electricity supply, financing costs, and policy inconsistencies significantly influence capacity utilization rates (Unegbu, & Ugwunna, (2024). For example, the food and beverage sector has shown positive growth when utilization rates are optimized, contrasting with sectors like cement where policy and infrastructure gaps hinder performance (Okeke, et al, 2025).

## 2.2 Theoretical Literature Review

The study was guided by two theories which were manufacturing growth model and endogenous growth model. The theoretical framework was adapted from Aminu, et al., (2022). The earlier theory is centered on a linkage between capital stock and the level of output of the firm while the later provides a new insight on the causes of variations in investment. The manufacturing growth model, for instance, was reported to use factors such as FDI inflows, interest rates, inflation and government incentives. For a country to experience high growth in manufacturing sector, it should put more efforts in investments on infrastructure (power supply), encourage foreign investments and monitor price fluctuation (inflation) and promote export of products. In the same vein, government incentive, interest rate, population growth rate and exchange rate were also vital.

The motivation for the endogenous growth model stems from the failure of the neoclassical theories to explain the sources of long-run economic growth. The neoclassical theory does not explain the intrinsic characteristic of economies that causes them to grow over an extended period of time. The neoclassical theory focuses on the dynamic process through which capital-labour ratios approach long-run equilibrium. In the absence of external technological change, which is not clearly explained in the neoclassical model, all economies will converge to zero growth. The neoclassical theory sees rising GDP as a temporary phenomenon resulting from technological change or a short term equilibrating process in which an economy approaches its long run equilibrium. The neoclassical theory credits the bulk of economic growth to a completely independent process of technological progress. According to neoclassical theory, the low capital-labour ratios of developing countries promise exceptionally high rates of return on investment.

Based on this premise, it was expected that the free market reforms imposed on highly indebted countries by the World Bank and the International Monetary Fund should have prompted higher investment, rising productivity, and improved standards of living. Yet even after the prescribed liberalization of trade and domestic markets, many LDCs experienced little or no growth and failed to attract new foreign investment or to halt the flight of domestic capital. The anomalous behaviour of developing world capital flows (from poor to rich nations) helped provide the impetus for the development of the concept of endogenous growth or, more simply, the new growth theory. The new growth theory represents a key component of the emerging development theory.

## 2.3 Empirical Literature Review

Okeke et al (2025) explored the impact of key macroeconomic variables on the growth and capacity utilization of Nigeria's manufacturing sector between 1981 and 2023, the study adopted the ARDL model, following necessary statistical tests to ensure the reliability of results. Findings indicate that high exchange and interest rates significantly hinder manufacturing growth, while inflation appears to drive growth but negatively affect capacity utilization. Bank credit and lower interest rates, however, support improved capacity utilization. Trade openness, GDP growth, human capital, labour force, and capital formation showed limited or insignificant influence.

Mazeli et al (2024) assessed the effect of manufacturing sector on Nigerian economy. The manufacturing sector faces inadequate electricity supply, poor infrastructure and plant maintenance, heavy dependency on foreign inputs, inadequate finance, high-cost of doing business, high import of locally produced goods and harsh operating environment. Data was obtained from CBN bulletin and analyzed using OLS technique. The research found out that manufacturing sector had a positive effect on GDP.

Aniefiok et al (2024) examined the relationship between manufacturing sector output and economic growth in Nigeria from 1981 to 2022. The study adopted a quantitative econometric technique using ordinary least square method. The OLS result revealed that manufacturing sector output has a positive but insignificant relationship with economic growth in Nigeria within the period reviewed. This implies that as manufacturing sector output increases, economic growth will also increase.

Lutengano, et al. (2023) investigated the Tanzania manufacturing sector's growth with a view to provide empirical lessons from macroeconomic factors with limited political regimes reflections. A vector error collection model was used to assess the influence of foreign direct investments, inflation, export of product, power supply, government expenditure, nominal lending interest rate, population growth rate and exchange rate. The estimated value of the coefficient measuring the speed of adjustment toward long-run equilibrium is statistically significant and negative, implying that the short-run shocks can be corrected back to the long-run equilibrium immediately in the following year so has to prevent the model from explosion.

Aminu et al (2022) examined how Nigeria's manufacturing output can be observed in estimating economic growth. The ARDL model and OLS technique were employed in the study assessments, and quarterly data was sourced from the CBN statistical bulletin and the NBS annual report. The study found that manufacturing output positively and significantly affects growth in Nigeria and therefore can significantly predict further economic growth

Michael (2022) in the study effects of Nigeria's manufacturing sector on economic growth between 1981 and 2018 are examined. In order to examine the relationship between the specified explanatory factors and the growth of the

Nigerian economy, the study used the OLS regression methodology. The findings indicate that the manufacturing sector's output has a positive and significant link with the increase of the gross domestic product, indicating that it has a favorable impact on that growth.

Oniyide and Ogunjinmi (2021) examined the effect of manufacturing capacity utilization on economic growth in Nigeria given the decadence that has been experienced in the manufacturing sector using annual data from 1980 to 2018 sourced from World Development Indicators (WDI) and Central Bank of Nigeria Statistical Bulletin. The study employed Johansen and the Canonical cointegration technique and impulse response function in order to investigate the response of manufacturing capacity utilization to a shock in gross domestic product proxy for economic growth. The Johansen cointegration result reveals a long run relationship among the variables. The empirical result reveals manufacturing capacity utilization significantly increases gross domestic product in Nigeria in the long run.

## 3.0 Methodology

### 3.1 Theoretical Framework

The study was guided by two theories which were manufacturing growth model (Kaldor first law) and endogenous growth model. The theoretical framework was adapted from Aminu, et al., (2022). The earlier theory is centered on a linkage between capital stock and the level of output of the firm while the later provides a new insight on the causes of variations in investment. Kaldor first law states that there exists a close relationship between the growth of the manufacturing output and economic growth. The endogenous growth model reveals the essence of technological usage or technical efficiency in kick-starting economic growth with an economy. The Endogenous growth model is of the form.

$$Y = AKL \quad (1)$$

Where:

Y = Economic growth (Output)
A = Total Factor Productivity or the efficiency parameter also called Technological
Progress.
K = Capital Stock
L = Labour.

Assuming symmetry across industries, the same level of capital and labour is utilized by each productive unit or industry. The production function is expressed as;

$$Y = AK^{\alpha}L^{\beta} \quad (2)$$

Where

α & β are elasticity coefficient.

It is assumed that A which is the efficiency parameter will depend on both the level of technology and quality of institution in the economy.

### 3.2 Model Specification

The model of the study is adopted and modified the work of Okeke et al (2025) that explored the impact of key macroeconomic variables on the growth and capacity utilization of Nigeria's manufacturing sector between 1981 and 2023. The model adopted and modified is given below:

$$MSG_t = \alpha_0 + \alpha_1 EXR_t + \alpha_2 INF_t + \alpha_3 TRO_t + \alpha_4 INTR_t + \alpha_5 GDP_t + \alpha_6 HCI_t + \mu_t \quad (3)$$

To achieve the objective of this study and based on the property of the linearity of variables, the functional form of the model used in this work was specified in equation 4 as:

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$$RGDP = f\left(MSO + MCU + EXR\right) \quad (4)$$

The linear form of the model used in this work was specified in equation 5;

$$RGDP_t = \beta_0 + \beta_1 MSO + \beta_2 MCU + \beta_3 EXR + \mu_t \quad (5)$$

Where:

RGDP = Real GDP
MSO = Manufacturing Sector Output
MCU = Manufacturing Capacity Utilization
EXR = Exchange Rate
$\beta_0$ = Constant term,
$\beta_1$ to $\beta_3$ = Regression coefficient
$\mu_t$ = Error Term.

To reduce the outliers among the variables, all variables will be expressed in logarithmic form.

$$LRGDP_t = \beta_0 + \beta_1 LMSO + \beta_2 LMCU + \beta_3 EXR + \mu_t \quad (6)$$

Model Specification for granger causality objective was expressed as:

$$\Delta \ln RGDP_t = \beta_0 + \beta_1 \Delta \ln RGDP_{t-1} + \beta_2 \Delta \ln MSO_{t-1} + \beta_3 \Delta \ln MCU_{t-1} + \beta_4 \Delta \ln EXR_{t-1} + \varepsilon_t \quad (7)$$

## 3.3 Method of Analysis

### 3.3.1 ARDL Model and Error Correction Mechanism

Pesaran et al. (2001) developed another method for finding cointegration among variables which is based on an ARDL model augmented by level variables. Contrary to the Engle Granger and Johansen approach, pretesting of the unit root is not needed because the test can be applied on both I(0) and I(1) variables. This is seen as a major advantage over the ARDL approach. Iqbal (2011) realized this by conducting a comparative study on three cointegration techniques (E.G, Johansen and ARDL) and noted that the 'auto regressive distributed lag' (ARDL) technique provided better predictions as compared with other cointegration methods. Also, these tests are subject to pre- is recommended for these tests to use a bigger size for significance such as 10% but not 5%. With the ARDL method such pre-test bias is not an issue. The general equation of the ARDL is as below:

$$\Delta y_t = \mu + \sum_{i=1}^{n-1} \alpha_i \Delta y_{t-i} + \sum_{i=0}^{m-1} \gamma_i \Delta x_{t-i} - \pi \hat{e}_{t-1} + \varepsilon_t \quad (8)$$

Where $\Delta$ is the difference operator, $y_t$ is a vector of dependent variable, xt-1 is the matrix of lag values of explanatory variables and is the adjustment effect or error correction coefficient which is expected to be negative for the error to be corrected.

Specifically, the ECM model to be tested is specified in equation.

$$\Delta \ln RGDP_t = \alpha_{0i} + \sum_{i=1}^{p} \alpha_{12} \Delta \ln RGDP_{t-i} + \sum_{i=1}^{q} \alpha_{22} \Delta \ln MSO_{t-i} + \sum_{i=1}^{p} \alpha_{32} \Delta \ln MCU_{t-i} + \sum_{i=1}^{p} \alpha_{42} \Delta EXR_{t-i} + \lambda ECT + \varepsilon_t \quad (9)$$

If λECT = 1 then 100% of the adjustment takes place within single period (instantaneous/full adjustment). If λECT = 0 then there is no adjustment. Thus, any other value is interpreted accordingly; a value of closer to 1 implies quick adjustment, and value closer to implies slow adjustment. To select the most fitted model lag length are chosen automatically by Akaike Information Criterion (AIC).

The null and alternative hypothesis for bound test concerning the test for cointegration is:

Ho: $a_i$=$\beta_i$=Υ1=$u_i = v_i = \omega_i$= 0 (No long run relationship).

H1:$a_i \neq \beta_i \neq$Υ1$\neq u_i \neq v_i \neq \omega_i \neq 0$ (there is long run relationship).

## 3.4 Type and Sources of Data

The study used time series data on Real GDP (RGDP) as dependent variable while Manufacturing Sector Output (MSO), Manufacturing Capacity Utilization (MCU) are experimental variables and Exchange Rate (EXR) as control variables over the period of 1980-2024. The data is sourced from World Bank and world development indicators.

## 3.5 Diagnostic and Stability Tests

Some of the diagnostic tests conducted include Breusch- Godfrey (BG) serial correlation test, Jarque-Bera (JB) normality test, Breusch-Pagan-Godfrey (BPG) heteroskedasticity test, and Ramsey Regression Equation Specification Error Test (RESET). Stability tests were carried out in this study which includes the cumulative sum (CUSUM) of recursive residual and also the cumulative sum of squares (CUSUMSQ) of recursive residuals tests, respectively.

## 4.0 Analysis of Results

## 4.1 Result of the Descriptive Statistics

Table 4.1 displays the summary statistics for the research. This table reveals that the summary of the descriptive analysis shows the mean, range, standard deviation amongst others. The summary statistics table provides a comprehensive overview of key variables from 1980 to 2024, including Real GDP (RGDP) as dependent variable while Manufacturing Sector Output (MSO), Manufacturing Capacity Utilization (MCU) are experimental variables while Exchange Rate (EXR) as control variable Some of the important aspects of descriptive statistics captured in this study include; mean, median, range, and standard deviation, among others. The result is presented in Table 4.1.

Table 4.1: Result of Descriptive Statistics

| | RGDP | MSO | MCU | EXR |
|---|---|---|---|---|
| **Mean** | 4.288095 | 14.30262 | 4.44E+12 | 59.27608 |
| **Median** | 4.200000 | 13.92938 | 1.25E+12 | 67.62020 |
| **Maximum** | 10.20000 | 21.09825 | 2.75E+13 | 154.2899 |
| **Minimum** | -13.10000 | 6.552817 | 2.82E+10 | 0.700000 |
| **Std. Dev.** | 4.539969 | 4.975591 | 6.84E+12 | 46.34165 |
| **Skewness** | -1.482317 | -0.018213 | 2.054574 | 0.290473 |
| **Kurtosis** | 6.779130 | 1.441035 | 6.571956 | 2.044668 |
| **Jarque-Bera** | 40.37404 | 4.255475 | 51.87695 | 2.187777 |
| **Probability** | 0.000000 | 0.119106 | 0.000000 | 0.334912 |
| **Observations** | 42 | 42 | 42 | 42 |

Source: Authors computation (2025), using Eviews-10

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A cursory look at Table 4.1 would reveal that the averages of MCU and EXR (that is 1.25E+12 and 67.62020, respectively) are relatively high compared to RGDP and MSO which averaged 4.200000 and 13.92938 for the period. These high averages for these variables signify instability owing to the high standard deviation values. The values of skewness are relatively low compared to those of the mean and standard deviation and this also shows that they all lie to the left, signifying that they are less than the value of the mean. The J-B statistic passed the significance test at the 10 per cent level for all the variables except for RGDP and MSO, which stands at 0.119106 and 0.334912 respectively. The implication for these statistical results is that the density function of the series is non-normally distributed.

Table 4.2: Unit Root Tests Result

| | ADF | | PP | | Order of Integration |
|---|---|---|---|---|---|
| | At Level | At 1st Difference | At Level | At 1st Difference | |
| LRGDP | -3.980578** | | -4.118004** | | I(0) |
| LMSO | | -3.461904** | | -6.419097** | I(I) |
| LMCU | | -3.746030** | | -4.240328** | I(I) |
| EXR | | -5.348709** | | -5.322467** | I(I) |

** denotes significance at 5% level.
Note: *, ** and *** indicate significant at 1%, 5% and 10% levels respectively
**Source**: Authors computation (2025), using Eviews-10

The ADF and PP results suggested that the null hypothesis of the presence of unit root in the variables in levels could not be rejected, indicating that the variables are non-stationary in levels. However, when the variables were first differenced, the null hypothesis of the unit root in each of the series was rejected at 5% significance level. From Table 4.2, the Unit Root result indicates that four of the variables RGDP which is the dependent variable is integrated of order zero. That is at level. This is because; the ADF test statistic calculated value of -3.980578 was found to be greater than the critical values in absolute term at 5 percent. However, LMSO, LMCU and EXR were found to be stationary at first order difference. In conclusion, the variables in the model shows a mixed order of integration (i.e. I(0) and I(1)variables), hence the justification for the use of ADF model.

## 4.3 ARDL Bounds Test

Table 4.3 presents the result of the ARDL bound test estimated with restricted constant using (1, 4, 1, 4) selected based on Akaike Information Criterion (AIC). The result of the bound test indicated that we reject the null hypothesis of no long run relationship because the value of the F-Statistics is (5.134915) higher than the upper and lower bounds of (3.67) and (2.79) at a 5% significant level, respectively. This implies that there exists cointegration among the variables included in the model. This result suggests that economic growth and the manufacturing output variables move together in the long run.

Table 4.3 Result of ARDL Bounds Test

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |

| | | | | |
|---|---|---|---|---|
| F-statistic | 5.134915 | 10% | 2.37 | 3.2 |
| K | 3 | 5% | 2.79 | 3.67 |
| | | 2.5% | 3.15 | 4.08 |
| | | 1% | 3.65 | 4.66 |

**Source**: Authors computation (2025), using Eviews-10

### 4.3.1 ARDL Short run

Table 4.5 shows the result of the ARDL short run and Long-run analysis estimates for model 2 and the error correction mechanism. The longrun analysis was conducted using the ARDL bound cointegration test.

Table 4.4: Result of the Short-Run Estimates

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|---|---|---|---|---|
| **Long Run Model** | | | | |
| LMSO | -1.310646 | 0.757978 | -1.729136 | 0.0985 |
| LMCU | -0.327940 | 0.112653 | -2.911066 | 0.0084 |
| EXR | -0.000647 | 0.003943 | -0.163957 | 0.8713 |
| C | 15.69172 | 4.745134 | 3.306908 | 0.0034 |
| **Short Run Model** | | | | |
| D(LMSO) | -1.310646 | 0.587559 | -2.230664 | 0.0367 |
| D(EXR) | -0.000647 | 0.003020 | -0.214120 | 0.8325 |
| D(EXR (-1)) | -0.006210 | 0.003361 | -1.847616 | 0.0788 |
| CointEq(-1)* | -1.422923 | 0.257377 | -5.528560 | 0.0000 |
| Prob(F-statistic) | F-statistic | | R-squared | Adjusted R-squared |
| 0.000024 | 7.890224 | | 0.818469 | 0.714737 |

**Source**: Authors computation (2025), using Eviews-10

The short run ARDL model was estimated to determine the extent to which the variables converge to form long run equilibrium relationship. The result of the short run cointegration error correlation term is negative and statistically significant at 5% level. This signifies that there is a short run relationship convergence between the variables. The coefficient of the error correlation term value -1.422923 which is equivalent to 142% of the short run disequilibrium error has the potential to converge and established a long run equilibrium relationship. The ECT coefficient is negative and statistically significant at the 5% level, this implies the presence of a short run relationship convergence between the variables to form the long run relationship. This has further reaffirmed the result of the ARDL Bounds Test.

The long-run relationship result indicates that that LMSO has negative but significant, at 5% significant level while first lag period of LMSO also has positive and insignificant effect on LRGDP. The second lag periods of LMSO have positive and significant effect on LRGDP at 10 % significant level. The third lag periods of LMSO have negative and significant effect on LRGDP at 5 % significant level.

Similarly, the coefficient of determination (R2) shows that 65 % of the variations in Economic Growth (LGDP) are explained by the explanatory variables (LMSO and EXR); apart from considering the degree of freedom, the adjusted coefficient of determination (adjusted R2) indicates that 54% variation in the Economic Growth (LGDP) can be explained by the explanatory variables. The F-statistic of 16218.92 with a probability value of 0.000062 confirmed the coefficient fitness of the model and showed

an overall significance of the explanatory variables jointly in explaining the dependent variable. The Durbin-Watson statistic value is 2.213750, which is approximately 2.0, indicating there is no autocorrelation in the model.

### 4.3.2 Result of Granger Causality Test

Interpreting the Granger causality result; the null hypothesis states that if P-value is greater than 5%, we cannot reject the null hypothesis but accept it; however, if otherwise, we reject the null hypothesis.

Table 4.5: Granger Causality Test

| Null Hypothesis: | Obs | F-Statistic | Prob. |
|---|---|---|---|
| LMSO does not Granger Cause LRGDP | 36 | 5.73303 | 0.0076 |
| LRGDP does not Granger Cause LMSO | | 4.11933 | 0.0259 |
| LMCU does not Granger Cause LRGDP | 36 | 0.50774 | 0.6068 |
| LRGDP does not Granger Cause LMCU | | 4.64407 | 0.0172 |
| EXR does not Granger Cause LRGDP | 36 | 3.64522 | 0.0379 |
| LRGDP does not Granger Cause EXR | | 0.01838 | 0.9818 |
| LMCU does not Granger Cause LMSO | 42 | 0.04779 | 0.9534 |
| LMSO does not Granger Cause LMCU | | 1.52823 | 0.2303 |
| EXR does not Granger Cause LMSO | 40 | 4.46138 | 0.0188 |
| LMSO does not Granger Cause EXR | | 0.55860 | 0.5770 |
| EXR does not Granger Cause LMCU | 40 | 0.10558 | 0.9001 |
| LMCU does not Granger Cause EXR | | 1.11268 | 0.3400 |

**Source**: Authors computation (2025), using Eviews-10

Table 4.8 presents the result of the Granger causality test which indicates that we reject the null hypothesis that LMSO does not Granger Cause LRGDP as the P-value is less than 0.05. Also, we failed to accept the null hypothesis that LRGDP does not Granger Cause LMSO as the p-value is less than 5% significant level. This indicates that there exists a bidirectional causal relationship running from LMSO to LRGDP.

## 4.4 Discussion of Findings

The study examined the impact of manufacturing output on economic growth in Nigeria. Manufacturing capacity utilization revealed a negative effect on economic growth in Nigeria. The result also underscores the t- test value (-0.402540) that manufacturing capacity utilization is negative towards explaining the variations in economic growth (GDP) in Nigeria. Hence, manufacturing capacity utilization has an insignificant effect on economic growth in Nigeria.

The findings of this study are obvious as the manufacturing sector output (LMSO) has a positive and strong effect on economic growth (LRGDP) in Nigeria. This is in line with economic a priori expectation of economic theories. This is because the output of primary manufacturing commodities account for substantial proportion of LRGDP in Nigeria during the study period. Equally, the major explanation for this growth of manufacturing sector output may be due to government policies that are in tandem with the improvement in the demand for output of manufacturing and the increase in manufacturing exports.

It was found that manufacturing capacity utilization has a negative and strong effect on economic growth (LRGDP) in Nigeria. The insignificant effect of manufacturing capacity utilization is as a result of low level of employment creation in manufacturing sector in Nigeria which needs to be addressed if the sector is to attain substantial growth.

The result of the bound test indicated that we reject the null hypothesis of no long run relationship because the value of the F-Statistics is (5.134915) higher than the upper and lower bounds of (3.67) and (2.79) at a 5% significant level, respectively. This implies that there exists cointegration among the variables included in the model. This result suggests that economic growth and the manufacturing output variables move together in the long run. The short run ARDL model was estimated to determine the extent to which the variables converge to form long run equilibrium relationship. The result of the short run cointegration error correlation term is negative and statistically significant at 5% level. This signifies that there is a short run relationship convergence between the variables. The coefficient of the error correlation term value -1.422923 which is equivalent to 142% of the short run disequilibrium error has the potential to converge and established a long run equilibrium relationship. The ECT coefficient is negative and statistically significant at the 5% level, this implies the presence of a short run relationship convergence between the variables to form the long run relationship.

The coefficient of determination (R2) shows that 65 % of the variations in Economic Growth (LGDP) are explained by the explanatory variables (LMSO and EXR); apart from considering the degree of freedom, the adjusted coefficient of determination (adjusted R2) indicates that 54% variation in the Economic Growth (LGDP) can be explained by the explanatory variables. The F-statistic of 16218.92 with a probability value of 0.000062 confirmed the coefficient fitness of the model and showed an overall significance of the explanatory variables jointly in explaining the dependent variable. The Durbin-Watson statistic value is 2.213750, which is approximately 2.0, indicating there is no autocorrelation in the model.

The Granger causality test which indicates that we reject the null hypothesis that LMSO does not Granger Cause LRGDP as the P-value is less than 0.05. Also, we failed to accept the null hypothesis that LRGDP does not Granger Cause LMSO as the p-value is less than 5% significant level. This indicates that there exists a bidirectional causal relationship running from LMSO to LRGDP. We cannot reject the null hypothesis that LMCU does not Granger Cause LRGDP as the p-value is above 5% significant level. Still, we cannot reject the null hypothesis that LRGDP does not Granger Cause LMCU as the P-value is more than 0.05.

## 5..0 Summary and Policy Implications

From the analysis of results so far, the findings revealed that:

i. The long-run relationship result indicates that that LMSO has negative but significant, at 5% significant level. The result of the bound test indicated there exist cointegration among the variables included in the model. This result suggests that economic growth and the manufacturing output variables move together in the long run. The ARDL short-run coefficient of LMSO has negative but significant. In the ARDL long-run, the coefficient LMCU has negative but significant effect on LRGDP therefore, based on these findings, the null hypothesis of Manufacturing output has no effect on economic growth in Nigeria cannot be rejected.
ii. The Granger causality test which indicates that we reject the null

hypothesis that LMSO does not Granger Cause LRGDP as the P-value is less than 0.05. Also, we failed to accept the null hypothesis that LRGDP does not Granger Cause LMSO as the p-value is less than 5% significant level. This indicates that there exists a bidirectional causal relationship running from LMSO to LRGDP. We cannot reject the null hypothesis that LMCU does not Granger Cause LRGDP as the p-value is above 5% significant level.

The purpose of this study is to examined the impact of environmental management and manufacturing output on economic growth in Nigeria. The empirical findings using the ARDL estimation approach show that financial development has a negative effect on economic growth while CO2PC emission has a positive effect on economic growth. Moreover, the estimated results show that CO2PC emissions have a significant effect on economic growth whereas energy consumption also has a positive effect on economic growth. The Nigerian economy grows so is its level of CO2PC emissions. The findings so far have demonstrated that the manufacturing sector output and manufacturing capacity utilization have contributed significantly to economic growth. The result of the empirical analysis provides useful insights to policy formulation and implementation.

Based on the study's findings, the study recommends that appropriate policy measures should be adopted to ensure manufacturing sector act as a catalyst to economic growth in Nigeria. Other specific recommendations are made viz:

i. There should be collaboration with major stakeholders improve the administrative, legal and fiscal environment of the manufacturing industries so as to increase the performance of the manufacturing sector for rapid economic growth and development. Government should equally intensify efforts toward promoting socio economic infrastructures, macroeconomic and institutional framework of the nation in order to bring in a good relationship between external and domestic institutions with the main objective of improving the performance of the manufacturing sector for sustainable economic growth and development.

ii. Provision and creation of more access to credits and effectively harnessing the mobilized funds towards productive manufacturing sector in the country. In doing so, manufacturing sector output will improve more, leading to higher increase in the contribution of the sector to real gross domestic product (GDP) of Nigeria.

iii. Proper and adequate funding of existing manufacturing industries so as to guarantee its externalities on the economy. In the process, awareness also needs to be created on the people, investors and manufacturers by concerned agencies in leveraging private-public participation for available opportunities so as to create access to credits from the International Financing Institutions.

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