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Manufacturing Sector Output And Economic Growth Nexus: Evidence From Nigeria

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Abstract
Despite the various attempts in Nigeria, the manufacturing sector's output contribution to Nigeria economic growth remains a big question. The objective of the study is to investigate the contribution of the manufacturing sector output on economic growth of Nigeria from 1986 to 2021. The study was designed as an ex-post facto research study using time series data and adopted the endogenous growth theory in specifying the model. The model specification is RGDP=f(Manufacturing Output, Bank credits to manufacturing sector, Capacity utilization of manufacturing sector). Source of data were Central bank of Nigeria economic bulleting, Manufacturers association of Nigeria, Nigeria Bureau of Statistics, and Bank of industry. The data were analysed using Autoregressive Distributed Lag model. The overall results revealed that the model is well specified and has a good fit judging by the high F-statistic and that, the change in the dependent variable is best explained by the independent variables included in the model. Although, the model was found to be well-behaved from the serial correlation test conducted, the heteroscedasticity results obtained and even the normality test conducted, the stability test revealed that for most of the time covered by the time series data, the model was unstable and only regained stability towards the end of the study period. The findings from the empirical analysis carried out revealed that there is a long-run relationship between manufacturing sector output and economic performance in Nigeria. It also revealed that in the short run, manufacturing sector output has positive and significant impact on the real GDP while in the long run, it has negative and insignificant impact on the real GDP of Nigeria. The credit available to the manufacturing sector and capacity utilization does not have significant impact on the real GDP both in the long-run and in the short-run. The study recommends that the government should prioritise and incentivise the manufacturing sector through proper policy implementation, funding, and increase capacity utilization, with the sole aim of increasing the overall output thereby contributing to Nigeria's economic growth.
Keywords: *Manufacturing Sector, Economic Growth, Nigeria.*

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I. Introduction

Industrialization (of which the manufacturing sector is a sub-set), is one of the key drivers of development in less developing countries (LDC). Recent research suggests that economic development requires structural changes from low to high productive activities and that the industrial sector is a key engine of growth in the development process. All cases of high, rapid, and sustained economic growth in modern economic development have been associated with industrialisation, particularly growth in manufacturing production (Szirmai, 2017).

Manufacturing industries are seen as a very essential tool in a developing country like Nigeria because the marginal revenue products of labour in the industrial sector are higher than the marginal revenue product of labour in the agricultural sector, Bolaky (2011). Based on this, the releasing of labour force from agricultural sector to the manufacturing sector increases the marginal product of labour in the agricultural sector and increases the overall revenue and output of the society and hence contributes to economic growth. Therefore, industrialization is an ideal policy option for sustainable economic growth in Nigeria. Nigeria currently has a balance of payment issue with notable growing trade deficit; 178 billion in 2018, 1.94 trillion in 2019, 1.99 trillion in 2020, 1.94T in 2021 and 4.1 trillion Naira in 2022. (Statista, March 2023).

The worsening balance of payment deficit accompanying dependency on imports for basic goods and services, for example, import bill increased by 107% between January and September 2021 compared to similar period in 2020 from $4.29 billion to $8.92 billion, leading to a negative trade balance of $-4.85 billion in 2021, an 870.55% increase from 2020 (WEF macrotend,2023) and the worsening exchange rate regime which could be attributable to this, makes it expedient that Nigeria should quickly fix the manufacturing sector to ameliorate this economic malaise if we are to see any meaningful economic development. Nigeria is currently facing an economic precipice as many manufacturing companies are relocating to neighboring West African countries, this may have negative implications for Nigeria's hope of an economic surge via the African Continental Free Trade Area (AfCFTA) treaty it signed into recently, if the manufacturing sector's contribution to the GDP remains at current levels.

The Manufacturing sector output accounted for less than 5% of GDP in Nigeria, but experienced 4.9% growth in 2000, in 2020 it accounts for 12.67% of GDP (World Bank, 2021). Due to the high costs of production that resulted from inadequate infrastructure, Nigeria's manufacturing capacity utilization remains low. The value of the manufacturing industry in Nigeria as of 2016, value added was $35,122,630,000. This value has fluctuated between $54,779,490,000 in 2014 and $860,643,300 in 1993 (World Bank, 2017). Kaldor's law, provides a conceptual framework for the link between manufacturing and economic growth. The argument of proponents of industrialisation relies on the productivity advantage of manufacturing over other sectors, as well as on the higher externalities that can arise from manufacturing and economic growth in Nigeria (Szirmai, 2019).

The major problem of the study therefore is, what is manufacturing output's contribution to Nigeria's economic growth, what are the factors affecting manufacturing sector's capacity to contribute to economic growth (for example, availability of credit?) what effect does capacity utilization in the manufacturing sector exerts on the economic growth of Nigeria? It is based on this situation that this study intends to investigate the effects of manufacturing sector output on the economic growth of Nigeria.

This study has become necessary given the declining economic growth forcast for Nigeria in recent times as real GDP declined by 4% from 2019 in 2020, and from 3.6% in 2021 to 3.3% in 2022 (AfDB,2023). It is believed that increase in manufacturing output will lead to increase in employment and household disposable incomes , which will stimulate increase in demand for additional goods and services, which could lead to increased capacity utilisation within the manufacturing sector, and more cheaper goods leveraging on economies of scale, and finally result in overall improvement in the welfare of the populace and stimulate economic growth. The broad objective of this study is to investigate the effects of manufacturing sector output on economic growth of Nigeria.

II. Literature Review

Theoretical Review

The Big Push Model

Paul Rosenstein-Rodan (1943), propounded this theory. The theory emphasizes that underdeveloped countries require large amounts of investments to embark on the path of economic development from their present state of backwardness. This theory proposes that a 'bit by bit' investment programme will not impact the process of growth as much as is required for developing countries. Rosenstein-Rodan argued that the entire industry which is intended to be created should be treated and planned as a massive entity (a firm or trust). He supports this argument by stating that the social marginal product of an investment is always different from its private marginal product, so when a group of industries are planned together according to their social marginal products, the rate of growth of the economy is greater than it would have otherwise been. The big push model is a concept in development economics or welfare economics that emphasizes that a firm's decision whether to industrialize or not depends on its expectation of what other firms will do. It assumes economies of scale and oligopolistic market structure and explains when industrialization would happen.

According to traditional neoclassical growth theory, output results from one or more of three factors; increase in labour quality and quantity (through population growth and education), increase in capital (through savings and investment)

Consequently, the new growth theory or theory or endogenous growth model, unlike the Solow model, explain technological change as an endogenous outcome of public and private investment in human capital and knowledge-intensive industries (Research and development), such as computer software and Telecommunication (Todaro and Smith,2005).

Leibenstein Critical Minimum Theory

This theory was propounded by Harvey Leibenstein (1966) where he elaborated that the overpopulated and underdeveloped countries are characterized by the vicious circle of poverty. They have low per capita income. His 'theory of critical minimum effort' is an attempt to provide a solution to this economic problem. According to him, critical minimum effort is necessary to achieve a steady economic growth raising per capita income. "In order to achieve the transition from the state of backwardness to the more developed state, where we can expect steady secular growth, it is necessary, though not always sufficient condition, that at the same point or during the same period, the economy should receive a stimulus to growth that is necessary than a certain critical minimum size. The main idea of the theory is that economic growth in the underdeveloped and overpopulated countries in not possible unless a certain minimum level of investment is injected into the system as a consolidated dose that pulls the system out of doldrums. This minimum level of investment is called 'critical minimum effort.

This theory also looks at the main factors of economic growth as the entrepreneurs, the inventors, the discoverers, the innovators, and those who can accumulate and utilize wealth, and those who can accumulate skills and spread knowledge. It considers these factors as working hand in hand with what he termed the incentives necessary to stimulate growth.

He further classified these incentives into two groups which can be found in developing economies namely, zero-sum incentives and positive-sum incentives. As their names imply, they have zero and positive effects on economic growth respectively. Zero-sum incentives do not contribute to economic growth, and they include trading and non-trading risks, transference of profits and income etc. These carry only distributive effects and are regarded as wastage of scarce resources which should be focused on increasing industrial output. Positive-sum incentives on the other hand, lead to greater economic growth and growth. These activities consist of the productive investment, use of technical know-how, exploration and exploitation of the new markets and the use of scientific discoveries and innovations etc. For the purpose of this study these positive-sum incentives will be of more relevance as they revolve around the expansion of human capital growth and by extension-industrialization.

In summary Leibenstein believed a critical minimum effort, in turn, would lead to:

(i) An expansion of the growth agents;

(ii) An increase in their contribution to per unit of capital, as the capital-output ratio declines;

(iii) A fall in the effectiveness of factors restricting growth;

(iv) The creation of an environment that stimulates socio-economic mobility; and

(v) The expansion of secondary and tertiary sectors.

Productivity Theory

This is one of the several modifications made to the Adam Smith's Absolute Advantage theory by H. Myint in 1958. It was mainly in favour of the less developed countries. The productivity theory points towards indirect dynamic benefits of a high order from international trade. By enlarging the size of the market and scope of specialization, export to a large extent encourages the use of machineries, encourages inventions and innovations, overcomes technical indivisibilities, raises labour productivity, and generally enables the trading country to enjoy increasing returns and lower costs, and leads to economic growth. Also, in the productivity theory, the process of specialization involves adapting and reshaping the productive structure of a trading country to meet its export demand. This emphasizes export production. Since international trade is beneficial to raising productivity and encouraging economic development, the country should go beyond a policy of free trade and encourage international trade and economic development.

Empirical Review

Although studies abound on the fact that manufacturing output play a significant role to the economic growth of any nation, researchers still hold divergent views. While some are of the opinion that bank credits, capacity utilization are vital for the development of the manufacturing sub sector, others are of the view that there are other factors that affect manufacturing sub sector.

Ogundipe (2022), investigated the impact of manufacturing sector on Economic growth in Nigeria from 1981 to 2018 , using ordinary least squares regression methodology. Capital, labour, direct foreign investment and exchange rate and manufacturing output were the variables deployed in in this study. 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 favourable impact on that growth. Additionally, there is a strong and positive correlation between capital and GDP, which suggests that capital can help drive GDP growth. This study however did not consider capacity utilisation nor effect of bank credits on manufacturing output and economic growth.

Ogunrinola and Osabuohien (2018) took an approach to examining the impact of manufacturing sector on employment using ordinary least square technique of analysis on a time series data for the period of 1990-2009 and discovered that manufacturing sector has a positive impact on employment level in Nigeria. Hence, they implied that countries who trade with other parts of the world generate employment into their economy which leads to economic growth. They however did not consider factors that could increase the manufacturing output such as credit or capacity utilization.

Tamuno and Edoumiekumo (2018) investigated the effect of electricity on the manufacturing sector in Nigeria from 1962-1975. The study was based on the famous Cobb Douglas production function and the method of analysis was the OLS regression analysis. The study discovered that labor and capital have a positive relationship and are also of economic and political importance. They also found that the substitution level in the Nigerian industrial sector is very low and further recommended that Nigeria government should review the electricity policy in Nigeria to serve as an incentive to manufacturing and hence industrialization in Nigeria. The study accommodated electricity as an input to industrialization but did not mention bank credit and capacity utilization.

Mandara and Ali (2018) examined the impact of manufacturing sub sector on economic growth in Nigeria for the period spanning from 1981 to 2015. The study was based on the endogenous growth theory and adopted the OLS regression as the method of analysis. They identified industrialization as the principal solution to the complex problems of Nigeria as well as other under-developed countries and it is the main key to economic growth. However, they concluded that by any standard, Nigeria would be classified as industrially underdeveloped, as effort that has been put into the industrialization process in the past years has exerted minimal impact on the output growth of the economy. They recommended that government should introduce policies that can create fair playing ground for foreign investors as this will attract more foreign investors to come and invest locally which will in turn leads to enhanced economic growth. Also, the industrial banks should be able to assist Nigeria industrialization in line with Nigeria's development plan and not a total shift to accepting models which worked elsewhere given their environment and circumstance which differs from place to place. This study was good but did not consider credit and capacity utilization as some of the variables in the study.

Zhao and Tang (2017) examined the effect of industrialization on the economic growth in China in comparison to Russia between the period 1995 and 2008. Using time series data and OLS methodology, they found out that the rise in economic growth in China over the period was to a large extent was the contribution from the manufacturing sector and to a lesser extent the service sector. However, in Russia, growth was to a large extent driven by the service sector, followed by the primary sector. The study recommended that efforts should be made to stimulate production in the industrial sector. It was discovered from the study that while the study was focused on China and Russia the variables used in the study was limited by time frame.

Ojegwo (2017) carried out a study on the effect of Bank Credits on the manufacturing sector in Nigeria using ordinary least square method and quantitative research design. The result shows that a unit change in commercial banks' credits in Nigeria brings about 84% significant increase in the dependent variable. A unit change in Commercial Bank to manufacturing sector brings about a 45% non-significant increase in manufacturing sector development. A percentage increase in Interest Rate brings about an 87% significant decrease in total manufacturing output. The study recommended that Government should increase its intervention funds and ensure that such funds are judiciously applied in promoting manufacturing sector growth in the country. Even though this study dwell on Bank credits on manufacturing development, the study did not capture capacity utilization.

Kaya (2017) investigated the effect of economic globalization on manufacturing employment in developing countries. The study is concerned with classic debate on the benefits of industrialization and how this affects developing countries. The study uses a comprehensive panel data set on 64 developing countries from 1980 - 2003. The results generally demonstrate that manufacturing employment increased in most developing countries. The study identifies economic growth, measured by GDP per capita as the most important factor influencing the size of manufacturing employment. Finally, the analysis provides limited argument for world systems/dependency theories. Raw materials exports do not significantly increase manufacturing employment while foreign direct investment has a negative impact in some models. The study concludes that the latest wave of economic globalization contributes to the increase in manufacturing employment in developing countries, although it is not the most significant factor shaping the size of manufacturing employment in these countries. It was also observed from the study that while it focused on the effect of globalization on the industrialization sector employment, the study was seriously limited in time frame and cannot account for the present realities on industrialization.

Dodzin and Vamvakidis (2017) examined the impact of Production on the economic growth of less developing countries. The study used multivariate regression model from a panel of 92 developing countries between the periods 1960–2012.Their findings revealed that an increase in openness to trade leads to an increase in the industrial value-added share of production, at the expense of the agricultural share and further recommended that trade leads developing countries to industrialization, in contrast to what the infant industry argument would imply. The author's study was limited in scope such that the study did not take Nigeria as one of the developing countries under study.

Archibong (2017) did a review of policy documents on the benefits of the famous structural adjustment program and its impact on industrialization in Nigeria. His findings revealed that SAP failed to aid industrialization partly because of existing structure of the Nigerian economy with its numerous bottlenecks, rigidities and infrastructural (electricity) shortages which tend to undermine the effectiveness of fiscal and other incentives designed to stimulate the growth and diversification of the sector. He therefore recommended in his review that the government should address such rigidities and bottlenecks to drive industrialization in Nigeria. The study was merely a review of policy documents and did not actually do a critical analysis using any variable.

Tyola (2017), carried out a study on manufacturing sector and economic growth in Nigeria, 1970-2007. The method of analysis adopted was the primal model of growth accounting which uses a neoclassical production in analyzing the sources of economic growth in Nigeria. It was ascertained from the study that during the four decades being studied, inputs to production contributed 69.7 percent of total real GDP growth while total factor productivity (TFP), contributed 30.3 percent of observed economic growth. TFP was interpreted as the rate of technological progress. Technological progress or innovation is by product of industrialization or industrial expansion. The author recognized technology as a critical input to production but did not take into consideration credit availability to manufacturers and Capacity utilization.

III. Methodology

Model Specification

The study adapted the endogenous growth model used by Mandara and Ali (2018) with slight modification and inclusion of macroeconomic variables which further identified the gap this study wants to fill. Their study investigated the effect of Manufacturing sector and economic growth in Nigeria from 1981 to 2015. They identified manufacturing output as the principal solution to the complex problems of Nigeria as well as other under-developed countries and it is the key to economic growth. However, they concluded that by any standard, Nigeria would be classified as industrially underdeveloped, as effort that has been put into the manufacturing process in the past years has exerted minimal impact on the output growth of the economy. They recommended that government should introduce policies that can create fair playing ground for foreign investors as this will attract more foreign investors which will in turn leads to enhanced economic growth. Also, the industrial banks should be able to assist Nigerian manufacturing sector in line with Nigeria's development plan and not a total shift to accepting models which worked elsewhere given their environment and circumstance which differs from place to place.

The model of their study was specified thus:

RGDP = f (Manufouput, Exchange Rate, Interest Rate)

Therefore, based on this model which was adapted and modified for this study with the inclusion of few variables, the model for this study was specified as follows:

$RGDP = f\{ Mafoutput, Bank\ credits\ to\ Manu\ subsector, Capacity\ utilization$	(3.1)

Equation (3.1) is the functional specification of the model. Econometrically, the model is specified as

RGDP = $\beta_o+\beta_1$MANU$+\beta_2$ $BCREMs$ $+\beta_3$ CAP +Ut

Where:

MANU = Manufacturing Output,

BCREMs = Bank Credits to the manufacturing sub sector

CAP = Capacity Utilization

Apriori Expectation

$\beta_1 > 0, \beta_2 > 0, \beta_3 > 0$

βo is constant.

Nature and Sources of Data

The relevant data for this study were obtained from various sources. The study adopted secondary data as information on these variables are readily available. RGDP data for the period under review was obtained from the CBN. Data on manufacturing output were sourced from National Bureau of Statistics and the CBN statistical bulletin for the period under review , bank credit to manufacturing sub sector was obtained from the Central bank and Bank of Industry data and capacity utilization obtained from Manufacturers association of Nigeria data.

Estimation Procedure

The following statistical tools were utilised to evaluate the data collected on the variables stated in the model specified earlier. This is to ensure a rigorous investigation of the model and the variables specified.

Unit Root Test

Unlike the popularly used unit root tests (e.g., ADF and PP) which test the null of non-stationarity without accounting for possible breaks-points in data, the break-point unit root test of Peron (1989) tests the null of non-stationarity against other alternatives while accounting for a single breakpoint in the given data. The alternative hypotheses for this test are succinctly described in the following equations:

$$z_t = \Upsilon_0 + \Upsilon_1 I_t + d(D)_t + \beta_t + pz_{t-1} + \sum_{i=1}^{p} \Delta z_{t-1} + e_t \quad (3.3)$$

$$z_t = \Upsilon_0 + \gamma T_t^* + \beta_t + pz_{t-1} + \sum_{i=1}^{p} \Delta z_{t-1} + e_t \quad (3.4)$$

$$z_t = \Upsilon_0 + \Upsilon_1 I_t + d(D)_t + \gamma T_t + \beta_t + pz_{t-1} + \sum_{i=1}^{p} \Delta z_{t-1} + e_t \quad (3.5)$$

The first equation captures a break in the intercept of the data with the intercept-break dichotomous variable I_t which takes on values of 1 only when t surpasses the break-point, the second captures a break in the slope of the data with a regime-shift dichotomous variable T_t* which takes on values of 1 only when t surpasses the break-point *Br*; and the third equation captures both effects concurrently with the "crash" dichotomous variable *D* which takes on values of 1 only.

ARDL Bounds Cointegration Approach

The popularly used residual-based cointegration methods may not be particularly useful when the time-series under consideration attain stationarity at different levels. On the other hand, in addition to being econometrically efficient for small sample cases (n < 30), the bounds cointegration method developed by Pesaran and Shin (1999) is particularly useful for combining time-series that attain stationarity at levels and first difference.

The bounds cointegration method makes use of upper bounds and lower bounds derived from 4 pairs of critical values corresponding to 4 different levels of statistical significance: the 1% level, the 2.5% level, the 5% level, and the 10% level. The null of "no cointegration" is to be rejected only if the computed bounds f-statistic surpasses any of the upper bounds obtained from a chosen pair of critical values, while the alternative hypothesis of cointegration is to be rejected only if the bounds f-statistic falls below any of the lower bounds obtained from a chosen pair of critical values. Therefore, in contrast to other cointegration tests, the bounds test can be inconclusive if the bounds f-statistic neither surpasses the chosen upper bound nor falls below the chosen lower bound.

To obtain the bounds f-test statistic, an f-test is performed jointly on all the un-differenced explanatory variables of the "unrestricted" error correction model (ECM) derived from any corresponding autoregressive distributed lag (ARDL) model such as the previously specified empirical ARDL model in (3.2). This takes the general form:

$$\begin{aligned}\Delta i_t = \alpha_0 + \sum_{i=1}^{n} MANU \quad \Delta i_{t-i} + \sum_{i=0}^{n} BCREMS \quad \Delta j_{t-i} + \cdots \\ + \sum_{i=0}^{n} CAP \quad \Delta k_{t-i} + b_1 i_{t-1} + b_2 j_{t-1} + \cdots \\ + b_j k_{t-1} + e_t\end{aligned} \quad (3.6)$$

where Δi_t denotes the chosen endogenous variable in first difference; Δj_t and Δk_t denote the chosen exogenous variables in first differences; and e_t denotes the stochastic component. Choosing the best lag-length to be included is made possible by information criteria such as the Akaike and the Schwarz Information Criterion.

In the case where the bounds cointegration test disapproves the null, a "restricted" version of the error correction model can be estimated along-side a long-run model to capture the relevant short-run and long-run dynamics as seen in the following expressions:

$$i_t = \Lambda_0 + \Lambda_1 j_t + \cdots + \Lambda_j k_t + v_t \quad (3.7)$$

$$\Delta i_t = \alpha_0 + \sum_{i=1}^{n} MANU\Delta i_{t-i} + \sum_{i=0}^{n} BCREMS\Delta j_{t-i} + \cdots + \sum_{i=0}^{n} CAP \quad \Delta k_{t-i} + \varphi\Gamma_{t-1} + e_t \quad (3.8)$$

Here, the error correction term Γ_{t-1} is non-positive and bounded between 0 and 1 (or 0 and 100) in order to capture the short-run rate of adjustment to long run equilibrium, while the coefficients $\Lambda_1,\ldots,_j$ in (3.7) capture the state of long-run equilibrium and are obtained from $\Lambda_1=b_2/b_1,\ldots, \Lambda_j=b_j/b_1$ respectively.

Justification of Estimation Technique

The choice of statistical estimation technique in this study, is premised on its ability to describe and simplify large volumes of data and also helps to explain the degree of interrelatedness of the dependent and independent variables. This method also provides an opportunity to forecast future outcomes based on historical data, drawing meaningful interpretations and reporting of research findings from models of the economy, Shrutika (2022).

IV. Data Presentation, Analysis, And Discussion Of Findings

Data Presentation

The overall objective is to examine the nexus between manufacturing output and economic performance in Nigeria. In achieving this overall objective, effort was made to combine the relevant data suitable for the empirical analysis. The selected variables were in line with the objectives and the various literature reviewed during the study. Data on Real Gross Domestic Products (RGDP), manufacturing output (MANU), Bank's credit to manufacturing sector (BCREMS) and Capacity Utilization (CAP) were used. The study collected secondary data from the statistical bulletin of Central Bank of Nigeria (CBN) for the year 2021. The time series data covers periods from 1986 to 2021 and is analysed using Autoregressive Distributed Lag (ARDL) model (See Appendices).

Descriptive Statistics

Table 1: Results of Descriptive Statistics

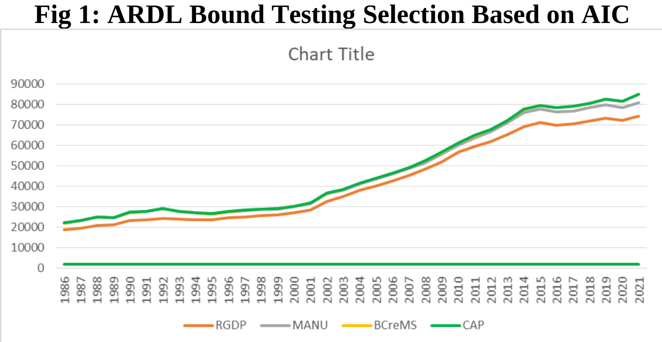
	RGDP	MANU	BCREMS	CAP
Mean	40530.17	4219.801	809.7975	47.31197
Median	34531.27	3585.022	313.2116	46.61235
Maximum	72393.67	6684.218	4089.292	62.04167
Minimum	17007.77	2898.474	4.475200	30.40000
Std. Dev.	20102.51	1346.537	1040.513	9.834536
Skewness	0.400680	0.844034	1.460592	-0.204399
Kurtosis	1.530271	2.072075	4.436876	1.713367

Source: Eviews 9

The results of the descriptive statistics showed that the standard deviation of real GDP, manufacturing sector output and capacity utilization are lower than the mean indicating that the data are clustered around the mean value while that of credits available for the manufacturing sector is higher than the mean indicating that the data is spread apart from the mean.

Trend Analysis

Fig 1: ARDL Bound Testing Selection Based on AIC



Source: Computed using Excel

The graph in figure 1 demonstrates the value of the variables over the stated period covered by this study and as can be seen, except capacity utilization which was flattened due to the fact that its value is below 100, all other variables were increasing from 1986 to 2021.

Stationarity Test

Part of the conditions for the successful application of the ARDL bound testing technique to cointegration is the need to ensure that none of the variables is beyond being integrated of the first order i.e. *I*(1). A mixture of *I*(0) and *I*(1) is sufficient for the applying the ARDL model; hence, the need to test for unit root of each of the variables in the model. The outcome of the unit root tests using the Augmented Dickey Fuller (ADF) test reveal that all the variables satisfy this condition. The results are presented in the Table 2.

Table 2: Unit Root Test

VARIABLE	ADF STAT	CRITICAL VALUES	STATIONARITY STATUS
RGDP	-3.785185	1% Critical Value (-4.284580) 5% Critical Value (-3.562882)** 10% Critical Value (-3.215267)	*I* (0)
MANU	-4.417354	1% Critical Value (-4.252879)*** 5% Critical Value (-3.548490) 10% Critical Value (-3.207094)	*I* (1)
BCREMS	4.991049	1% Critical Value (-4.284580)*** 5% Critical Value (-3.562882) 10% Critical Value (-3.215267)	*I* (0)
CAP	-3.097861	1% Critical Value (-4.243644) 5% Critical Value (-3.544284) 10% Critical Value (-3.046990)*	*I* (0)

Note: *Significant at 1% (***), 5% (**) and 10% (*)*
Source: *Computed using Eviews 9 (See appendices)*

Table 2 below shows the unit root test results of the logged variables. Stationarity test is very useful in analysing time series data in the sense that it revealed the behaviour of the data over the period covered by the study. The unit root results is not only relevant in determining the analytical technique suitable for the study, but also equally important in how these techniques are applied. From the table, if the absolute value of the ADF (Augmented Dickey-Fuller) statistic is greater than the critical value, either at 1%, 5% and 10%, the variable is said to be stationary at that point. From the ADF results, only Manufacturing output (MANU) is stationary at 1st difference, i.e., integrated of order one (1) denoted as *I*(1), other variables; Real Gross Domestic Production (RGDP), Credit available to manufacturing sub-sector (BCreMS) and Capacity Utilization (CAP), i.e. *I*(0). This satisfy the condition for adopting ARDL approach to cointegration as stated by Pesaran and Shin (1996) and Pesaran and Pesaran (2001) which implies that none of the series is *I*(2) and can all be included in the ARDL estimation. The unit root results are reliable and is supportive of the evaluation techniques adopted for analysing the data collected for this study.

Bounds Cointegration Test Results
Lag Selection Criteria

The lag selection criteria were generated through the application of the ARDL estimation technique on Eviews automatically. The ARDL model was used to test the existence of long-run relationship among the variables which includes RGDP, MANU, BCreMS and CAP. In the ARDL procedure employed, the optimum lag length selection criteria was carried out to determine the number of lag(s) to be included in the ARDL models prior to the bound test. The results are presented in Table 3.

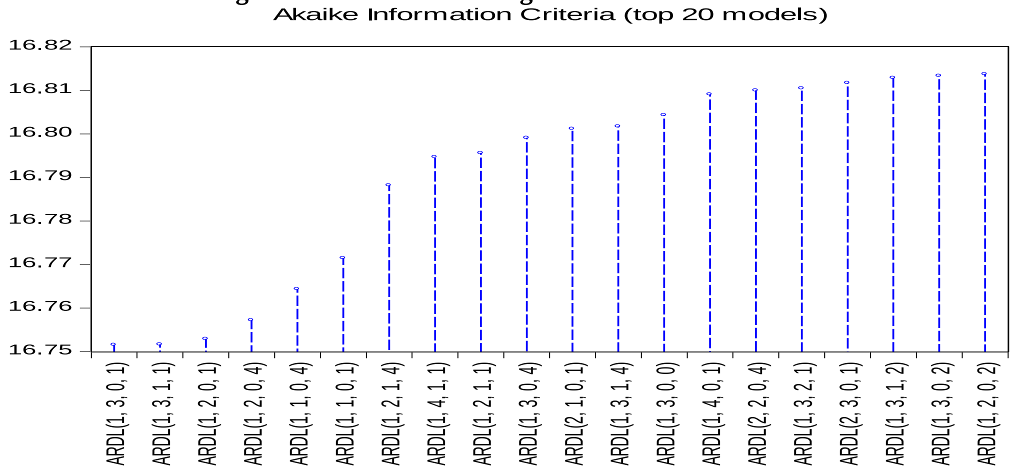
Table 3: Lag Length Selection for ARDL Model

Lag	AIC	SC	HQ
1	16.751566*	17.163804*	16.888211*

Source: Authors' computation using E-views 9

From Table 3, the Akaike Information Criterion (AIC), Shwarz Criterion (SC) and Hannan-Quinn Criterion. The results presented shows the minimum lag possible for the given set of time series data available for the regression. Also, the ARDL 1,3,0,1 selection is further buttressed by the graph below which supports the selection as it has the shortest vertical line based on AIC.

Fig 2: ARDL Bound Testing Selection Based on AIC



Source: E-views 9

As can be seen from the graph, the order of estimation with the least AIC is ARDL 1,3,0,1.

Estimated ARDL Model

Table 4: Estimated ARDL Model

Dependent Variable: RGDP		
Independent Variables	Coefficients	P-values
C	833.1002	0.6028
RGDP(-1)	0.975380	0.0000***
MANU	1.430745	0.0085***
MANU(-1)	-1.850826	0.0191**
MANU(-2)	-0.094825	0.9010
MANU(-3)	-0.594012	0.2284
BCREMS	0.650921	0.1986
CAP	58.29647	0.1099
CAP(-1)	60.43936	0.1032
Note: *** Statistical significance at 1% level; ** statistical significance at 5%;		
* Statistical significance at 10%		
Source: Authors' computation using E-views 9		

Table 4 shows the estimated ARDL results which established the relationship between the variables at their respective order. The order of the ARDL is 1,3,0,1 and as such, RGDP(-1), MANU, MANU(-1), MANU(-2), MANU(-3), BCREMS, CAP and CAP(-1) were obtained from the estimation. Given the probability value obtained, only RGDP(-1), MANU and MANU(-1) were statistically insignificant at 5% level of significance, the rest are statistically insignificant.

Bound Test for Cointegration

The bound test is to detect and confirm the present of long-run cointegration between manufacturing sector output variables and economic performance. The results of the ARDL bounds testing approach are shown in Table 5.

Table 5: ARDL Bounds Test for Cointegration

Dependent Variable: ΔRGDP		
F-Statistics (K = 3)		8.561894**
Critical Value	Lower Bound	Upper Bound
1%	4.29	5.61
5%	3.23	4.35
10%	2.72	3.77

Note: *** Statistical significance at 1% level; ** statistical significance at 5%;	
* Statistical significance at 10%.	

Source: Authors' computation using E-views 9

Having conducted the unit root test and the optimum lag selection, F-statistic test for cointegration is required to determine whether there is cointegration among the variables captured in the unrestricted error correction version of the ARDL model. This has been estimated using the bound testing approach and the results presented in Table 5 above. The bound test results revealed the existence of long run relationship among the variables. In the function (ARDL 1,3,0,1), the null hypothesis that there is no cointegration is rejected at 5% level as the F-statistic; 8.561894 is greater than the critical value, 4.35 at the 5% upper bound indicating that there is cointegration among the variables. Next step is to examine the long run impacts of Real GDP on the manufacturing output in Nigeria using OLS technique.

Estimated Long-Run Coefficients

The bound test has revealed the existence of cointegration among the variables. Therefore, the long-run relationship between Real GDP and manufacturing output variables has also been estimated using the ARDL approach with ARDL (1.3,0,1) specification selected based on Akaike Information Criterion and the results are presented in Table 6.

Table 6: Estimated Long Run Coefficients of ARDL Model

Dependent Variable: RGDP		
Independent Variables	Coefficients	P-values
C	33837.79164	0.7095
MANU	-45.040579	0.5030
BCREMS	26.438250	0.3587
CAP	4822.658998	0.4096
Note: *** Statistical significance at 1% level; ** statistical significance at 5%;		
* Statistical significance at 10%		
Source: Authors' computation using E-views 9		

The estimated long run relationship between the variables using OLS is reported in Table 6. The results revealed a negative relationship between the contribution of manufacturing sector to the real GDP and the Real GDP. The study further revealed with a P-value of 0.5030 that the negative impact of MANU on the RGDP is statistically insignificant and cannot be relied be upon. In a similar vein, both credit available to the manufacturing industries and capacity utilization have been estimated to have positive but statistically insignificant impact on the real GDP of Nigeria over the period covered by this study. From the table, the P-value of BCREMS and CAP were 0.3587 and 0.4096 respectively indicating that no significant relationship exists between these variables and the real GDP.

Estimated Short-Run Coefficients

The short-run relationship between Real GDP and manufacturing output variables is estimated using the error correction model and the results are presented in table 7 as follows.

Table 7: Estimated Short-Run Coefficients of the Selected ARDL Model

Dependent Variable: RGDP		
Independent Variables	Coefficients	P-values
Δ(MANU)	1.430745	0.0085***
Δ(MANU(-1))	0.094825	0.9010
Δ(MANU(-2))	0.594012	0.2284
Δ(BCREMS)	0.650921	0.1986
Δ(CAP)	58.296472	0.1099
ECM(-1)	-0.024620	0.4821
Note: *** Statistical significance at 1% level; ** statistical significance at 5%;		
* Statistical significance at 10%		
Source: Authors' computation using E-views 9		

From the short-run estimated results obtained from the analysis, only contribution of the manufacturing sector to the real GDP at first difference Δ(MANU), was statistically significant at 5% level of significance, all the remaining variables were statistically insignificant in the short run. The Error Correction Mechanism (ECM) assumed the expected negative sign but was also statistically insignificant in the short run. The ECM was -0.025 implying that the seed of adjustment to equilibrium among the variables in the case of any shock is just 2% which is rather too low.

Model Evaluation Results

R^2* and Adjusted *R^2

Table 8: R^2 and Adjusted R^2 from Estimated ARDL Model

Dependent Variable: RGDP		
R-squared (R^2)		**Adjusted R^2**
0.998381		0.997841
(99.8%)		**(99.7%)**
Source: Authors' computation using E-views 9		

The coefficient of determination (R^2) is 0.998381 while the adjusted R^2 is 0.997841. The result shows that 99.8% of the changes in the real GDP are caused by variations in the explanatory variables of the regression.

T-Test and F-Test

Table 9: F-Test Results

Dependent Variable: RGDP		
F-Statistic	**P-Value**	**Remarks**
1849.479	0.000000	Jointly Significant at 5%
Durbin Watson statistics	2.157699	

Source: Authors' computation using E-views 9

The F-statistic (1849.479) is significant at 1% which means that the model is adequate. The Durbin Watson statistics is 2.157699 which shows the absence of serial correlation as it above 2. This result is further collaborated in the Breusch-Godfrey Serial Correlation LM Test in table 12.

Table 10: T-Test Results

Dependent Variable: RGDP			
Regressors	**T-Statistic**	**P-Value**	**Remarks**
C	0.527272	0.6028	Insignificant
RGDP(-1)	28.28431	0.0000	Significant
MANU	2.866669	0.0085	Significant
MANU(-1)	-2.513452	0.0191	Significant
MANU(-2)	-0.125657	0.9010	Insignificant
MANU(-3)	-1.235937	0.2284	Insignificant
BCREMS	1.321979	0.1986	Insignificant
CAP	1.660075	0.1099	Insignificant
CAP(-1)	1.694022	0.1032	Insignificant

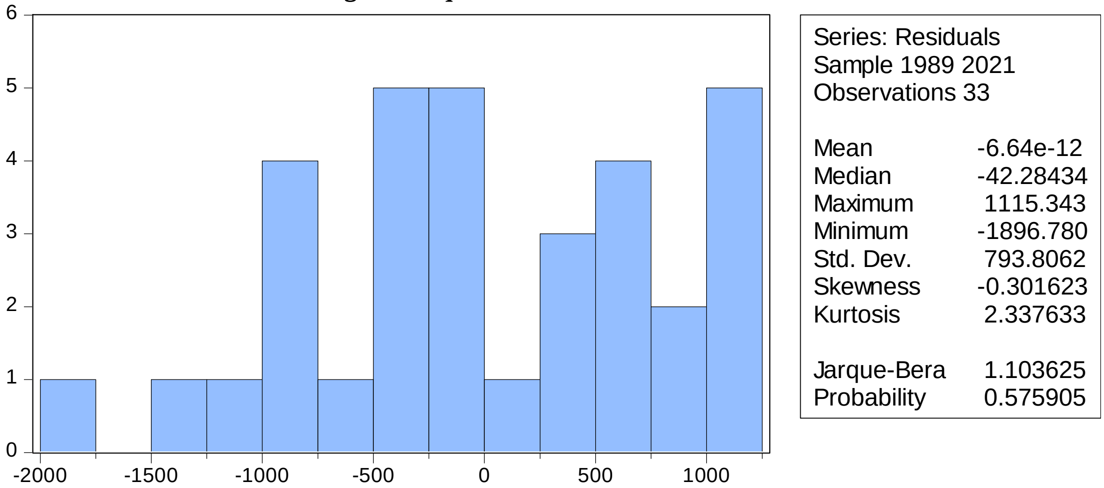
Source: Authors' computation using E-views 9

The t-test results obtained from the estimated ARDL (1,3,0,1) model, only the coefficients of RGDP(-1), MANU and MANU(-1) were found to be statistically significant at 5% LOS, the remaining coefficients were found to be statistically insignificant judging by the probability value obtained from the regression results.

Residual Normality Test

The method adopted for testing the normality of the residual is the Jarque-Bera test statistic. The null hypothesis is to be accepted if the absolute value of the Jarque-Bera statistic surpasses the observed value under the null hypothesis. On the contrary, the null hypothesis is to be rejected if the absolute value does not surpass the observed value. The result obtained is presented in figure 3.

Fig. 3: Jarque-Bera Test Statistic Results



Source: E-views 9

Based on the Jarque-Bera test conducted, the probability of 0.58 which is greater than 0.05 indicating that the null the hypothesis should be accepted. This result implies that the disturbances are normally distributed in the regression.

Heteroskedasticity Test

The study also conducted the heteroscedasticity test which seeks to establish whether there is a difference between the variance of the population, i.e., constant variance. The null hypothesis is to be accepted if the LM statistic exceeds the observed value under the null hypothesis. On the contrary, the null hypothesis is to be rejected if the LM statistic does not surpass the observed value. The result is as shown in table 11.

Table 11: Results of the Heteroscedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey		
L M Version	CHSQ (8)	6.845773 (0.5534)
F Version	F (8,24)	0.785239 (0.6201)

Note: *** Statistical significance at 1% level; ** statistical significance at 5%;
* Statistical significance at 10%.
Critical values are obtained from Pesaran et al. (2001).

To test for heteroscedasticity, autoregressive conditional heteroscedasticity test was carried out and the null hypothesis which says that the model is homoscedastic could not be rejected going by the p-value (0.5534). This indicates that the model is not heteroscedastic.

Serial Correlation Test

The serial correlation test is to ascertain whether there is correlation between successive variables in the model. The null hypothesis should be rejected if the computed coefficients are found to be statistically significant otherwise it should be accepted. The results obtained are given in table 12.

Table 12: Results of the Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test		
L M Version	CHSQ (4)	4.426085 (0.3514)
F Version	F (4,20)	0.774497 (0.5546)

Note: *** Statistical significance at 1% level; ** statistical significance at 5%;
* Statistical significance at 10%.
Critical values are obtained from Pesaran et al. (2001).

From table 12, the Lagrange Multiplier (LM) test was adopted, and the p-value is 0.3514 which is not significant and indicating that the null hypothesis of no serial correlation is accepted. This is indeed a desirable result proving the adequacy of the estimated ARDL model.

Model Specification Test
To test that the model is well specified, the Ramsey error test was conducted, and the results are given in table 13.

Table 13: Results of the Regression Error Specification Test (RESET)

Ramsey RESET Test		
t-statistic	df = 23	1.092549 (0.2859)
F-statistic	df (1,23)	1.193663 (0.2859)

Note: *** Statistical significance at 1% level; ** statistical significance at 5%;
* Statistical significance at 10%.
Critical values are obtained from Pesaran et al. (2001).

Table 13 shows the results obtained from the Ramsey error test. From the results, both the t-statistic and the F-statistic is not statistically significant as the probability values are greater than 0.05. This implies that the estimated model is free from specification errors and as such is reliable, and inferences can be made from the model.

Discussion of Findings
The study was embarked upon to examine the nexus between the manufacturing sector output and economic growth of Nigeria. From literature, there has been diverse stands or outcomes from different studies as to whether there is significant relationship between these two variables. This study, having reviewed the various approaches and findings, gathered data, and analysed based on existing theoretical background revealed that there is no significant long-run relationship between manufacturing sector output and economic growth. The results from the long-run ARDL estimation shows that manufacturing sector output does not have significant impact on the real GDP of Nigeria in the long run however, the short-run results indicated that manufacturing sector output has significant impact on the real GDP.

These findings are not in agreement with the works and findings of Ogundipe (2022), Adeoye (2015), Mandara and Ali (2018) and Ojegwo (2017) which revealed that manufacturing sector has significantly contributed to economic growth and that the commercial bank credits, particularly according to Ojegwo (2017) has tremendous impact on the output of the manufacturing sector. But the study also disagrees with the findings of Omosebi and Saheed (2016) on bank credits to manufacturing sector which revealed that there is a long run relationship between economic growth and bank credits to manufacturing sector.

These findings implies that the manufacturing sector output in the long run has not been able to significantly impact on the economic growth of Nigeria. This is largely because Nigeria's manufacturing productivity is low, and this is ultimately feasible, as Nigeria is more of an importing nation than exporting country over the period of this study. Also, due to variety of reasons, ranging from the low amount of credit available to this sector compared to other commercial endeavours and maybe, due to corruption and diversion, the credits available to the manufacturing sector has not been able to make significant changes in the output. The low performance of the manufacturing sector as evident from this study can also be attributed to Nigeria's weak industrial base and government reliance on a mono-product (crude oil based) economy, which may be responsible for other economy ills like hyperinflation, exchange rate instability and economic recession.

V. Conclusion And Recommendations

Based on the findings of this study, the manufacturing sector output did not significantly contribute to the economic growth of Nigeria between 1986 and 2021 in the long run but was significant in the short run. These results obtained can be attributed to the fluctuation in the manufacturing output level over a long period of time, hence; it only had significant impact in the short run but not in the long run. This results further validates the ineffectiveness of government policy over the period of study as Nigeria shifted from a production-focused economy in the early 1980s to a buying and selling (commerce based) economy from the early 1990s post SAP till around 2018 when efforts began to be put in place again to encourage local manufacturing started to show some level of increased activity and thus contribution to economic growth.

The credit available to the manufacturing sector does not significantly affect the economic growth of Nigeria during period covered by this study both in the short run and in the long run. The funds made available to the manufacturing sector is not enough to boost the production by the manufacturing sub-sector , and as such, is insignificant towards contributing to output and further the economic growth of Nigeria.

The capacity utilization rate has no significant impact on the economic performance both in the short run and in the long run during the period covered by this study. This goes to enforce the conclusion that manufacturing output in the long run is statistically insignificant. Capacity utilization measures the percentage of the expected manufacturing output as actually being produced, hence; low-capacity utilization indicates low output and as such, could not significantly affect the economic performance.

Based on the significance of this study and the findings obtained from the analysis carried out, the study presents the following recommendations:

The government should establish mechanisms tailored towards incentivising and increasing the manufacturing sector activity in Nigeria , which we believe is the backbone of economic growth, given its capacity to generate employment, leading to increased household income, which ultimately will stimulate demand for goods and services, which in turn will lead to increased production. Leveraging on economies of scale leads will lead to lower prices and overall economic welfare of the population. Increased manufacturing activity will not only encourage the use of products from the primary sectors like agriculture and the extractive industries, but will encourage entrepreneurship among the teaming unemployed youths , bringing about innovation that will further stimulate further economic growth. Consistent short run productive activities will ensure long run stability and growth for the economy.

Government should encourage the commercial banks to finance manufacturing sector activities, when manufacturing businesses have access to finance at concessionary rates, it reduces the cost of production and also reduces risks , making manufacturing ventures more attractive. This could spur innovation that is required to completely overhaul and increase the current manufacturing capacity and output, that would lead to long term economic growth.

There is the need to stimulate the Nigerian economy with market-based policies which will increase demand for Nigeria products. This will incentivise capacity utilisation in the manufacturing sector , and in the long run could positions the manufacturing sector to produce items that could compete with products from all over the world, thereby stimulating economic growth.