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Manufacturing Subsector and Economic Growth in Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors designed, analyzed, interpreted the results, read and approved the final manuscript.

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ABSTRACT

The manufacturing subsector has become increasingly important as the engine and driver of economic growth in both developing and developed economies. This study set out to investigate the relationship between manufacturing output and economic growth. The analysis was conducted using time series data from the period of 1981-2013. To quantify the relationship between manufacturing output and economic growth, an eclectic model consisting of both the Kaldor's first law of growth and the endogenous growth model was estimated. Findings from the study showed that manufacturing output, capital and technology were the major determinants of economic growth. Results also confirm that quality of institutions and labour force does not exert any impact on economic growth. The study concludes that the provision of capital in the form of financial resources to fund the manufacturing sector will greatly improve manufacturing activities in Nigeria. Furthermore there is the need to improve resource allocation to the field of research and development to promote innovative development such as technology adaptation to boost manufacturing activities within the country.

Keywords: *Economic growth; manufacturing output.*

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1. INTRODUCTION

Industrialization is the core driver of the modern economy. It serves as a catalyst for ensuring the transformation of an economy from one that is purely agrarian to an economy that fully harnesses its factor endowment and relies less on the supply of raw materials and finished goods from external sources. Despite this fact in the last ten years the average contribution of the manufacturing output share of GDP has not exceeded five percent (CBN, 2012). This rather poor performance of the Nigerian manufacturing sector, despite the nation's abundant natural resources and surplus labour has been a deep source of concern for policy makers in Nigeria. Studies have contended that the manufacturing sector does play a leading role in an economy, by providing quality jobs and reducing poverty. It has been further stated that the structural transformation of a traditional economy dominated by primary activities into a modern economy with high productive activities in which manufacturing assumes a prominent role remains a defining feature of economic growth and development [1]. The economic blue- print known as vision 2020 maintains that the growth rate of the manufacturing subsector must grow at an average of 25 per cent between the year 2010–2015 for the economy to be rated amongst the largest twenty economies in the world by the year 2020 [2].

[3], posit that the manufacturing sector is the major determinant of the level of industrialization and real growth of any economy. It plays a vital role in providing intermediate inputs, finished goods, increasing foreign exchange earnings, positive spill over effects and employment opportunities. [2], advanced further that the manufacturing output is the major driver of economic growth in most developing countries. However, most African countries including Nigeria, despite several industrial policies implemented by various policy makers within the pre- structural adjustment programme (SAP) era such as Import Substitution Industrial Strategy (ISI) and the export promotion Strategy implemented in the post- SAP era and the Small and Medium Enterprise Scheme, have witnessed slow growth. The developmental success of the East Asian Tigers also called the newly industrialized countries (NICs) has been attributed to the not to their natural resource endowment but to transformation of their manufacturing sector, which has further culminated into rapid economic growth for these

countries [4]. However, Nigeria though endowed with natural resources is still bedeviled with the problems of widespread poverty, low standard of living and rising unemployment coupled with her over dependency on the oil sector and the drastic neglect of other sectors such as agriculture, mining, and the manufacturing sector there also exist the challenge of rather slow technological progress.

Given the enormous role the manufacturing subsector is expected to play in the industrialization of the economy, the question then arise, of whether the Nigerian manufacturing subsector has been the driver of the much desired economic growth within the Nigerian economy? The aim of this study was to analyze the effect of the manufacturing sector on the growth of the economy using empirical data from the period of 1981- 2013. The rest of the paper is divided into six sections. Section 2 presents literature review, Section 3 focuses on the performance of the manufacturing sector, section 4 handles the methodology, section 5 analyses the estimated result, and section 6 discussion of finding and section 7 concludes the paper.

2. LITERATURE REVIEW

The role of manufacturing subsector in the economy has been the focus of various studies within Nigeria with some studies asserting the manufacturing and industrial output as the drivers of economic growth while other studies have refuted these findings. [5], in a study on the impact of industrialization on economic growth in Nigeria using the VECM methodology, showed that capital/ industrial output ratio and the labour/ industrial output ratio has a negative impact on per capita GDP. The finding reveal that human capital, income levels and industrial output have not reached the threshold needed to contribute reasonable to economic growth. In addition [6], in their study conducted for Nigeria, using time-series data consisting of annual observations for 28 years on economic growth, manufacturing sector output, exchange rate, inflation and interest rate observed that the contribution of industrial output to economic growth was below the expected threshold despite various industrial polices put in place since independence. This was attributed to inadequate electricity supply. This view was further corroborated by [7], the causality result further revealed that the contribution of the industrial sector to economic development was rather poor and far below

expectation and this was again attributed to the attendant problem of poor electricity supply in Nigeria. The findings of [2], on the industrial sector using time series data, showed that although the share of manufacturing and mining had positive impact on growth of the real GDP, the share of electricity consumption, skills and dummy as proxy for policy shift showed a negative relationship with growth in output. The study further revealed that the pioneer industrial scheme of the 1960's had not resulted in the growth of the industrial sector. Its contribution to GDP remained quite low, about 26 per cent.

Other studies such as [2,8,9] have focused on identifying the problems militating against the development of the industrial/ manufacturing sector in Nigeria. The problems include poor business environment which is characterized by poor macroeconomic environment, bureaucratic bottle necks, poor legal environment this creates property and safety right problem, there is also the problem of weak global competitive indices, poor and inadequate infrastructure, poor implementation of manufacturing exports incentives, lack of access to financial credit, technological backwardness, dearth of foreign investment flow into the manufacturing sector and inadequate demand. In a conceptual analysis [8], also submitted that the problems plaguing the Nigerian manufacturing sector include; undue dependency on the oil sector for income, weak infrastructure, and lack of skilled labour, inadequate financial resources / credit coupled with the attendant problem of poor management and planning. They stressed that for the manufacturing sector to function effectively as a strategic propeller of economic growth the problems mentioned above have to be tackled. In a related study conducted for Nigeria on macroeconomic determinants of industrial development [10] observed that the Nigerian government had embarked on several industrial programmes with the goal of boosting industrial productivity but all effort have failed to yield the required positive result.

Other researchers, [11,6,12], have argued that Nigeria's over dependency on oil has been a curse rather than a blessing due to the blatant mismanagement of the revenue from the oil sector which should have been channeled to the simultaneous development of other sectors of the economy such as agriculture, mining and manufacturing. [12], further opined that the volatility of oil prices has produced a distortionary effect on the manufacturing process because

manufacturers have been forced to pay more for energy resources which they utilise in the manufacturing process. The utter neglect of the non- oil sector of the economy in favour of its oil sector, which includes the manufacturing sector, has had a detrimental effect on the industrial development of the country. [9], further stated that excessive bureaucracy and rampant corruption have added to the problems faced by Nigerian manufacturing sector. It has also been argued that the skill and technology usage level in Nigeria are at rather low levels in comparison to other nations of the world and very slow progress has been made in the area of investment in human capital and adoption of new technology, thus affecting the efficiency of firms that have little or no investment in the field of research and development. It must be noted that none of the studies mention above have examined the link between manufacturing output and economic growth in Nigeria this is the gap this study intends to fill.

2.1 Theoretical Issues

Various theories have been propounded to describe the relationship between manufacturing output and economic growth. These theories include the Kaldor growth laws, big push theory and variants of the endogenous growth theory. [13], while accounting for the growth rate differences between industrialised economies presents a series of laws. He further posited that the growth trajectory of developed economies in the post war period displayed the relationship between industrial growth and the performance of the economy as a whole. This observation is the origin of Kaldor's first law which states that there is a close relationship between the growth of manufacturing output and the growth of the gross domestic product (GDP). This first law is summed up in the expression that the "manufacturing industry is the engine of economic growth". The Linear specification of Kaldor's first law is as follow:

$$gGDP = a_0 + a_1 gMANU;$$

where: gGDP is the growth of total output; and gMANU is the manufacturing output's growth.

It is important to note that the correlation between the two variables is not only due to the fact that manufacturing output represents a large component of total output. The regression coefficient is expected to be positive and less than unity. This means that the overall growth rate of the economy is associated with the

excess of growth rate of manufacturing output over the growth rate of non-manufacturing output. This means that high growth are usually found in cases where the share of manufacturing industry in GDP is increasing [14].

Another theory on industrial development the "Big Push" theory popularly associated with Rodenstein-Rodan (1968), postulates that a comprehensive programme is needed in form of a high minimum amount of investment to overcome the obstacles to development in an underdeveloped economy and to launch it on the path of progress. The theory further states that successful industrialization of an underdeveloped economy requires a holistic and simultaneous approach; First there must be training of labour on skill acquisition, capacity building, simultaneously infrastructure facilities like good transport system, power and steel, telecommunication system etc. must be developed. Secondly other sectors of the economy like agriculture must be modernised to promote both forward and backward linkages [15]. This assertion is the view of the proponents of the doctrine of the "balanced growth". The theory of balanced growth advocated by Rodenstein-Rodan, Ragnar Nurkse and Arthur Lewis, which states that simultaneous investment in all sectors of the economy, is actually necessary to ensure that all sectors grow in unison because this will ensure economic growth and development. It also means the development of the manufacturing and agriculture sector [16].

In the mid-1980s, a group of growth theorist became increasingly dissatisfied with the neoclassical growth theory, and began advocating for a theory that favoured endogenous factors as long run determinants of growth instead of exogenous factors. Variants of the model of endogenous growth include the works of Arrow (1962), Romer (1986), and Lucas (1988). The endogenous growth theory advances that economic growth is primarily the result of endogenous and not exogenous (external) forces. The theory further proposes that investment in human capital, innovation and knowledge are significant contributors to economic growth. Focus is on positive externalities in the economy, which will lead to economic growth. The endogenous growth theory primarily holds that the long run growth rate of an economy depends on policy measures such as, subsidies for research and development (R&D), development of human capital in the field of R&D, and appropriate institutions that enforce

patent, property right and contracts, promote increase growth rate by increasing the incentive for innovation. The AK model which is the simplest endogenous model assumes a constant exogenous saving rate. It models technological progress with a single parameter (usually A) and further assumes that the production function does not exhibit diminishing returns to scale. The rationale for this assumption has been given to include positive spill overs from capital investment to the economy as a whole or improvements (i.e. learning by doing). However, the endogenous growth theory is further supported by models which optimize the resource allocation to research and development leading to technological progress (Romer, 1990). Proponents of the endogenous growth theory argue that in the absence of technological progress (A) given the assumption of diminishing marginal returns to capital economic growth will eventually decline. Advances in technological progress depend on the quality and strength of institutions that are operational within a particular economic system and this in turn affects the manufacturing output. These institutions which promote contract enforcements, security and property rights are expected to stimulate innovations and ideas, reduce transaction cost, correct government failure and ultimately promote economic growth. [17], describe contract intensive money (CIM) as an objective measure of the quality of institutions that ensure the enforceability of contract and property rights. [18] while analyzing the relationship between institution and economic performance utilized the contract intensive money (CIM) as a proxy for measuring institutional quality the study revealed that contract intensive money has a positive relationship with economic growth.

2.1.1 Overview of the manufacturing sub-sector in Nigeria

On the importance of manufacturing sector to any economy, the world economic forum in 2013 noted thus "the manufacturing sector not only adds value to the overall economic growth but also creates more jobs than any other sector" [19].

The data in Table 1 shows the sectorial contribution of Agriculture and Manufacturing sub-sectors to the nation's gross domestic product (GDP). The contribution of the Agricultural sector of the economy to GDP on the average for the period under review was 40 per cent. The manufacturing sector has over the past ten years

performed rather poorly, with the manufacturing sector contribution to GDP on the average approximating a very low single digit of 4 per cent and Capacity utilization on the average was 51 per cent this statistic clearly reveals that in Nigeria the manufacturing subsector is not the driver of growth within the Nigerian economy.

Table 1. Nigeria’s sectorial contribution to the GDP

Year	Share of agriculture	Share of manufacturing	Capacity utilization
1999	43.5	3.5	34.6
2000	42.7	3.5	36.1
2001	42.3	4.1	42.7
2002	42.1	3.7	55.0
2003	41.0	3.6	57.0
2004	41.0	3.7	56.1
2005	41.2	3.8	55.0
2006	41.7	4.0	53.3
2007	42.0	4.0	53.4
2008	42.1	4.1	54.0
2009	41.7	4.2	59.0
2010	41.40	4.2	55.8
2011	40.19	4.2	55.1
2012	39.2	4.2	-

Source: Central Bank of Nigeria Statistical Bulletin Various Issues

3. METHODOLOGY

The period of analysis extends from 1981 to 2013. The econometric approach is multiple regression of time series data. The theory employed to examine the relationship between manufacturing output and economic growth, is the triangulation of Kaldor first law and the endogenous growth theory.

3.1 Model I

Kaldor first law states that there exists a close relationship between the growth of the manufacturing output and economic growth.

The linear specification is;

$$RGDP = F(MANU) \tag{1}$$

Where; RGDP and MANU are the growth of total output which (represents economic growth) and manufacturing output.

The endogenous growth model reveals the essence of technological usage or technical efficiency in kick-starting economic growth with an economy. Technical or technical progress has

been argued to depend on the strength of institutions which are the formal and informal constraints on political, economic and social interactions [20].

The Endogenous growth model is of the form

$$Y = AK^\alpha L^{1-\alpha} \tag{2}$$

Where:

- Y = Real Gross Domestic Product (RGDP) used as proxy for economic growth
- 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;

Where α & β are elasticity coefficient.

$$Y = AK^\alpha L^\beta \tag{3}$$

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. The quality of institutions can be proxied by contract intensive money (CIM).

$$A = F(TECH, CIM) \tag{4}$$

Where:

- Tech = technology (time variable, one year represents one data point).
 - CIM = contract intensive money, calculated as broad money supply minus currency in circulation divided by broad money supply used as an indicator of institutional quality.
- Substituting equation 4 into 3

$$Y = F(TECH, CIM, K, L) \tag{5}$$

For Nigeria to achieve sustained economic growth, the manufacturing sector must be willing to invest in both human and material capital development. Labour force must be trained in the field of research and development with emphasis on the technology. The model is further transformed, by substituting equation 4 into equation one which is the model of the kaldor’s law;

$$RGDP = F(MANU, TECH, CIM, K, L) \tag{6}$$

Where:

- RGDP = Real gross domestic product (RGDP)
- CIM = Contract Intensive Money
- MANU = Manufacturing output
- K = capital proxied by Gross fixed capital formation
- L = Labour force.

A parsimonious specification of equation (5) in log form will be estimated for Nigeria; the time series properties of all variables will be tested to avoid spurious regression results.

4. RESULTS AND DISCUSSION

The Augmented Dickey-Fuller (ADF) tests, is used to investigate the characteristics of the time series variables in model one the results as presented in Table 2, shows that all the series (variables) are stationary at first difference. That is, the result indicates that the variables RGDP, TECH, CIM, MANU, GFCF, and LF are integrated of order one – 1(1).Therefore, to confirm and determine the existence of a long-run relationship among the variables in the equation, a co- integration test was carried out.

The Johansen co-integration test Table 3 indicates four co- integrating equation(s) at 5 per cent and 1 per cent levels. Since there are four

co- integrating vectors, the conclusion can be drawn that there exists a unique long-run relationship between the LOG of real gross domestic products (RGDP) and other explanatory variables captured in the model, LOG(MANU), LOG(LABF), LOG (CIM), LOG(GFCF) and LOG (TECH).

The existence of four co- integrating variables implies that an economic interpretation of the long run impact of manufacturing output on economic growth can be obtained by normalizing the estimates of the unconstrained co-integrating equation(s) on economic growth. The identified co-integrating equation can then be used as an error correction term (ECM) in the error correction model.

Having established the extent and form of co-integrating relationships between the variables of the model, an over parameterized error correction model was estimated. At this level, the over parameterized model cannot be given any meaningful economic interpretation because it is difficult to determine the optimal lag for the variables on the right hand side of the model; Its main function is to enable us identify the main dynamic patterns in the model. To eliminate all insignificant lags, this study adopted the more preferred parsimonious model. Table 4 shows the result of the parsimonious model.

Table 2. ADF unit root test

Variables	ADF statistics (Computed)		5 % Critical value		Remark
	Level	1 st Difference	Level	1 st Difference	
RGDP	-2.748529	-3.55840	-2.9591	-2.9627	1 (1)
TECH	1.901325	4.901324	-2.9591	-2.9627	1 (1)
CIM	-1.910209	-6.362153	-2.9591	-2.9627	1 (1)
MANU	2.74323	3.324111	-2.9591	-2.9627	1 (1)
GFCF	0.274323	-4.553718	-2.9591	-2.9627	1 (1)
LABF	0.162405	-3.997876	-2.9591	-2.9627	1 (1)

Source: Computation by Authors (2015)

Table 3. Johansen co-integration test for economic growth model

Series: RGDP MANU LAB KAP CIM TECH				
Lags interval: 1 to 1				
Eigenvalue	Likelihood Ratio	5 Percent Critical value	1 Percent Critical value	Hypothesized No. of CE(s)
0.987935	268.3443	59.46	66.52	None **
0.915428	131.4033	39.89	45.58	At most 1 **
0.680896	54.82861	24.31	29.75	At most 2 **
0.408093	19.41921	12.53	16.31	At most 3 **
0.096988	3.162612	3.84	6.51	At most 4

(**) denotes the rejection of the hypothesis at 5 %(1%) significance level L.R. test indicates 4 cointegrating equation(S) at 5% significance level.

Source: Computation by Authors (2015)

From Table 4, the value of manufacturing output is positive and conforms to economic theory. This implies that 5 per cent increase in the current year manufacturing output will lead to 3.28 per cent in economic growth (RGDP). Also the coefficient of manufacturing output is significant at 5 per cent.

The current value of labour force has a positive sign and this conform to economic theoretical expectation. The coefficient of labour force is not statistically significant at 5 per cent level. The implication is that a 5 per cent increase in the current year level of labour force will result in a 20.08 per cent rise in the current level of economic growth. The result shows that the activities of the current labour force, has an insignificant effect on the current level of economic growth.

In the same table both current level and the lagged value of capital are positive, but while the current level of capital is significant at 5 per cent, its one year lagged value is not. It follows that an increase in the volume of capital by 5 per cent will increase the volume of economic growth within the economy by 0.36 per cent.

The current year and one year lagged value of institutional quality (Proxied or measured by contract intensive money), have a positive sign and this is in line with economic apriori expectation. The coefficient of current and lagged values of institutional quality, are not statistically significant at 5 per cent level.

The coefficient of technology is correctly signed and statistically significant at 5 per cent level, implying that we are 95 per cent confident that a 5 per cent increase in the volume of technology will improve the level of economic growth by 10 per cent, all things being equal. This reveals that improving the level of technology especially in the area of accruing technology changing skills (disembodied) skills and technology – using (embodied) skills in the manufacturing sector will tremendously enhance the level of economic growth.

The coefficient of the error correction mechanism (ECM) is correctly signed and statistically significant, this supports our earlier argument that the variables are indeed co-integrated. The ECM shows a relatively high speed of adjustment (43 per cent) of the short-run and long-run equilibrium behaviour of gross domestic product (economic growth) and its explanatory variables.

The adjusted R^2 indicates that about 59 per cent of the total variation in economic growth (measured by real gross domestic product) is explained by changes in the explanatory variables. Thus, the model has a good fit. The F-statistics (14.06) indicates that all the variables are jointly statistically significant at 5 per cent level. The Durbin Watson statistics of 1.9 reveals no evidence of serial or auto correlation.

3.1 Discussion of Findings

The result of the parsimonious error correction model for economic growth, indicates that three variables; manufacturing output, capital proxy by the gross fixed capital formation and technology are found to exert tremendous effect on economic growth in Nigeria.

The quality of institutions proxy by the contract intensive money is found to be statistically insignificant but consistent with economic theory both at the current and one year lagged values. This show that in Nigeria, the institutions needed to protect contracts and enforce property rights are underdeveloped and inefficient in the performance of their functions, thus making economic agents risk averse towards investment in the economy. Estimates of labour force and one year lagged value of capital measured by gross fixed capital formation in the model are positive but statistically insignificant, this shows that in Nigeria past levels of capital do not influence real output level in the economy. The result of the labour force estimate is not startling, given that the average school enrolment for primary, secondary and tertiary education levels are 16.8 million, 4.6 million and 1.4 million respectively and essentially the labour force is characterized by the dominance of semi- skilled and unskilled labour [21]. For the labour force to have any significant impact on economic growth there must be increased and continuous investment in human capital development and on research and development (R&D). The current year capital component of the estimated model is also statistically significant and conforms to economic theory. On the basis of this result, current capital is seen as an important factor for continual improvement and development of economic activities in Nigeria. This capital must be channeled towards productive investment such as investment in the manufacturing and not consumption activities.

The parsimonious results show that manufacturing output is statistically significant

Table 4. Parsimonious model for economic growth model

Dependent variable: LOG(RGDP)				
Variable	Coefficient	Std. error	t-statistic	Prob.
D(LOG(MANU))	0.655574	0.599805	2.092979	0.0001
D(LOG(LAB))	4.015204	20.75995	0.193411	0.8483
D(LOG(KAP))	0.072506	0.911357	1.979559	0.0035
D(LOG(KAP(-1)))	1.183266	0.933620	1.267396	0.2177
D(LOG(CIM))	0.116292	0.202642	0.573882	0.5716
D(LOG(CIM(-1)))	0.269555	0.202414	1.331696	0.1960
D(LOG(TECH))	2.001431	2.578121	2.511003	0.0001
ECM(-1)	-0.425215	1.521017	-3.661135	-0.0000
C	12.96578	0.589953	21.97766	0.0000
R-squared	0.599650	Mean dependent var		13.03013
Adjusted R-squared	0.586500	S.D. dependent var		1.146663
S.E. of regression	1.095948	Akaike info criterion		3.238753
Sum squared resid	27.62537	Schwarz criterion		3.608815
Log likelihood	42.20068	F-statistic		14.05815
Durbin-Watson stat	1.954155	Prob(F-statistic)		0.00000

Source: Computation by Authors (2015)

and its coefficient has the correct a priori sign and is consistent with Kaldor's first law of growth. The result strongly highlights the relative importance of manufacturing output in the determination of economic growth in Nigeria. This is because as it increases, it enhances economic growth, ceteris paribus. This result is consistent with the findings of [3,2]. Specifically, [3] maintained that the manufacturing sector is the major determinant of the level of industrialization and real growth of any economy.

4. CONCLUSION

This study has attempted to assess the impact of manufacturing subsector on economic growth.

The result from the empirical investigation revealed that manufacturing output, capital and technology exert tremendous effect on economic growth in Nigeria, both in the short run and long run, while the quality of institutions, labour force and previous year capital do not have any impact on economic growth within the period of the study.

For the manufacturing sector output to have a significant positive influence on economic growth, there are certain enabling conditions and policies that must be operational within the economy, these include, availability of capital, technological progress and quality institutions which protect and enforce property rights, contracts and skilled labour force the absence of which will pose a challenge to the effective performance of the manufacturing sector. The

results further revealed that increased funding for the training of the labour force on how to produce technological goods via expanding the frontiers of adaptation, invention, discovery, and increasing the accumulation of technology changing skills, will not only allow for increased efficiency in the manufacturing sub sector but will further promote long term economic growth.

In view of the foregoing, for the manufacturing sector to be the agent for propelling the much desired economic growth, therefore policy makers must place premium on creating certain enabling conditions such as increasing investment in the area of capital development, promote increased funding in the field of innovative technological advancement, the absence of which will greatly hamper the development of innovation and ideas, increase transaction cost, and will eventually lead to a decline in manufacturing output and economic growth in Nigeria.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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