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MANUFACTURING SECTOR AND ECONOMIC GROWTH IN NIGERIA: EVIDENCE FROM AUTO REGRESSIVE DISTRIBUTIVE LAG (ARDL)

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ABSTRACT

The study examines the impact of manufacturing sector on economic growth in Nigeria using time series data from 1985 to 2022. Data was subjected to unit root tested using Augmented Dickey Fuller and Phillips Perron, the test showed that real gross domestic product, manufacturing output and agricultural output are stationery at first difference while exchange rate is stationery at level. From the Auto regressive Distributive Lag (ARDL) model result, it indicated that in the short run, manufacturing output has positive but statistically insignificant impact on real gross domestic product, at lag 1 and 3 it is negative and statistically insignificant while lag 2 it is positive and statistically significant impact on real gross domestic product. It further revealed that agricultural output has negative and statistically insignificant impact on real gross domestic product in Nigeria, at lag 1 it is negative also but statistically significant impact on real gross domestic product in Nigeria. Exchange rate itself has positive but statistically insignificant impact on real gross domestic product, at lag 1 it is negative and statistically insignificant, at lag 2 it is negative but statistically significant while lag 3 it is positive and statistically significant on real gross domestic product in Nigeria. From the long run coefficient it found that manufacturing output has positive but statistically insignificant impact on real gross domestic product. Also, agricultural output has positive but statistically insignificant impact on real gross domestic product. Exchange rate has negative and statistically insignificant impact on real gross domestic product in Nigeria. The study recommended that government should make adequate foreign exchange available to manufacturers in order to acquire raw materials at cheaper cost for production.

KEYWORDS: MANUFACTURING, ECONOMIC GROWTH, PRODUCTION

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Introduction

Manufacturing has generally been described and accepted as a catalyst for economic growth and development all over the world, industrialization under industrial sector is widely conceived as a critical tool for accelerating economic growth and development. In the words of Olorunfemi, Obamuyi, Adekunjo & Ogunleye (2013), the manufacturing sector provides medium to produce goods and services, facilitate good jobs, and also earn the economic agents' handsome rewards. According to Adofu, Taiga & Tijani (2015), it has been argued that the fastest channel by which rapid sustainable growth and development is achieved in any economy is via industrial capacity.

The manufacturing sector is one of the most dynamic sectors in Nigeria.

Manufacturing industries in Nigeria so far has done well in production of goods to the nation. Recently, study has shown that Nigeria goods are exported to other countries. Nigerians now patronize made in Nigeria goods. The performance of the industry sector improved slightly during the first half of 1997 where the industry production index 132.6 increased by 0.69 over its level in the first half of 1996 but declined by 0.2% below that level in the second half of the same year. The rise in output relative to the position during the corresponding period in 1996 was accounted for by1.0 and 0.4% increase in mining and manufacturing production. Manufacturing has the highest multiplying effect than any other sector of our economy. The development of emerging country mainly depends on the performances and structure of manufacturing sector in the country (Adugna, 2014

The link between the growth of manufacturing output and the growth of GDP is sometimes referred to as Kaldor's first growth law (Pacheco-López and Thirlwall, 2013). The economic transformation or structural change observed in most developed countries was due to the development of manufacturing sector. Since the late 18th century, the manufacturing sector has been the main engine of growth and catch up (Szirmai, 2009). Manufacturing sectors are ready to power the economy. With the right policies in place, it will transform a difficult and sluggish recovery into an economic resurgence.

Empirical literature

Afolabi, et al., (2019) examined the impact of manufacturing sector output on economic growth in Nigeria from 1981 to 2016. The study adopted Auto Regressive Distributive Lag (ARDL). Based on the results, it showed that manufacturing capacity utilization has positive impact on RGDP, money supply also influences RGD. The result also indicated a unidirectional causality between RGDP and manufacturing capacity utilization, money supply. Victoria (2019) analysed the determinants of manufacturing sector performance and its contribution to gross domestic product in Nigeria using Vector Error Correction model for the period of 1981 to 2015. The study found that labour force, gross fixed capital formation and exchange rate showed a positive long run relationship with the manufacturing value added, the average manufacturing capacity utilisation, lending interest rate and government expenditure showed a long run negative relationship.

Joshua (2018) investigated the impact of manufacturing on Economic growth in Nigeria using GDP, manufacturing output, and manufacturing capacity utilization as variables. The study employed Autoregressive Distributed Lag (ARDL) model. The Bounds testing result revealed that manufacturing has a long run positive impact on economic growth. It recommended that Government should make adequate foreign exchange available to manufacturers to acquire raw materials for production. Oburota and Okoi (2017) investigated the relationship between manufacturing output and economic growth in Nigeria using real

gross domestic product, manufacturing output, gross fixed capital, and labour as variables in the model. The study employed Vector Error Correction model and finds 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 also recommends that 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.

Ebenyi, et al., (2017) examined the impact of trade liberalization on manufacturing value-added in Nigeria between 1970 and 2014. The study employed Auto Regressive Distributive Lag (ARDL) model, Findings from the study reveal that the Nigerian economy has not changed its export structure over the 1970 - 2014 periods. The only changes that have taken place to its exports were just a mere shift in exported product indicating a sign of export substitution from primary agro industry-based exports to primary mining industry-based exports (i.e crude oil). Okon and Osesie (2017) examine the impact of manufacturing sector on economic growth in Nigeria from 1981 to 2015 using ordinary least square method. Variables employed in the study include Gross domestic product, manufacturing output, investment, government expenditure, and money supply. Findings indicate a significant positive relationship exists between manufacturing output and economic growth in Nigeria. However, the most profound of the hazards faced in manufacturing sector are physical hazard, chemical hazard, and psychosocial hazard as revealed by the mean score result. The study recommends that government should intensify effort at improving physical infrastructure notably in power supply and make it more accessible to manufacturers to reduce self-supply of electricity which brings huge operating cost.

Sola, et al., (2103) Examined the manufacturing performance for sustainable economic development in Nigeria. Fixed effect model was used. The results indicated positive relationship between manufacturing and capacity utilization and import, as 1 percent change in capacity utilization and import lead to 43081 and 3.8 percent change in manufacturing respectively. However, there is a negative relationship between manufacturing and each of investment, exchange rate, and export, a 1 percent change in investment, exchange rate and export lead to 0.04, 12729, 0.3 percent reduction in manufacturing respectively. Onakoya, et al., (2012) examined the impact of trade openness on manufacturing sector performance in the Nigerian economy, using a time series data from 1975 to 2010, the study employed Vector Error Correction. The resulted shows that trade openness has a positive impact on the manufacturing sector performance while exchange rate, inflation rate have a negative impact on the sector performance. The error correction coefficient also indicated the rate of adjustment for disequilibrium of the variables shows that growth in the manufacturing sector adjusts slowly in the economy.

Methodology

The model of the study is specified as

$$GDP = F(MAOUP, AGROUP, EXRATE) \quad \text{(3.1)}$$

Where

$GDP = Gross\ domestic\ product$

$MAOUP = Manufacturing\ output$

$AGROUP = Agricultural\ output$

$EXRATE = Excachnge\ rate$

The econometric model is specified as

$$GDP_{t-1} = \alpha_o + \alpha_1 MAOUP_{t-1} + \alpha_2 AGROUP_{t-1} + \alpha_3 EXRATE_{t-1} + \varepsilon_t \quad \text{(3.2)}$$

Where
α_o = constant term

ε_t = error term
$\alpha_1, \alpha_{2,} \alpha_{3,}\ \alpha_4,\ and\ \alpha_5$ are the parameters to be estimated.

ARDL Model and Error Correction Mechanism

If the variables are cointegrated then there is the need to test for ECM which shows how much of the disequilibrium is being corrected over a period; what is called 'adjustment effect' (Asteriou and Hall, 2007). ECM possesses advantages of resolving the problem of spurious regression because it eliminates trend in the variables involved; and that the disequilibrium error term is stationary variable, which is prevented from exploding over time (Asteriou and Hall, 2007). The general autoregressive distributed lag (ARDL) ECM is presented in equation

$$\Delta y_t = \mu + \sum_{i=1}^{n-1} a_i \Delta y_{t-i} + \sum_{i=0}^{m-1} \Upsilon_i \Delta x_{t-i} - \pi \hat{e}_{t-1} + \varepsilon_t \quad \text{.....(3.3)}$$

Where Δ is the difference operator, y_t is a vector of dependent variable, x_{t-1} is the matrix of lag values of explanatory variables and π 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.

$$\Delta\, OILP_t = \mu + \sum_{i=1}^{n-1} a_i \Delta\, OILP_{t-1} + \sum_{i=0}^{m-1} \beta_i \Delta\, EXRATE_{t-i} + \sum_{i=0}^{m-1} \Upsilon_i \Delta\, INFL_{t-i} + i{=}0m{-}1ui\Delta\ INTRt{-}i{-}\pi et{-}1{+}\varepsilon t \quad \text{.....(3.4)}$$

If π = 1 then 100% of the adjustment takes place within single period (instantaneous/full adjustment). If $\pi = 0$ then there is no adjustment. Thus, any other value is interpreted accordingly; a value of π closer to *1* implies quick adjustment, and value closer to0implies 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=β_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).

Empirical Results and Discussion

Table 1 descriptive statistics

Statistics	LRGDP	LMAOUP	LAGROUP	EXRATE
Mean	11.35249	5.964946	6.286290	104.8232
Median	11.31303	6.052011	6.628544	118.5667
Std. Dev.	0.217305	0.777066	0.935987	92.11279
Skewness	0.240000	-0.346637	-0.532075	0.698063
Kurtosis	1.521565	1.964890	1.917857	2.759744
Jarque-Bera	3.523581	2.263450	3.359193	2.926717
Probability	0.171737	0.322477	0.186449	0.231458
Observations	35	35	35	35

Source: Researcher computation using E-views 10.

Table 1 above shows the result of descriptive statistics of the study, it indicates that the standard deviations of the variables employed are not far away from their means. The Skewness of the distribution shows negative values of manufacturing output and agricultural

output, this means that these variables are not normally distribution because their values are negatives and less than zero while real gross domestic product and exchange rate are positively skewed, this shows that they are normally distributed. For Kurtosis in the result shows that all variables employed are not normally distributed because their kurtosis values are more and less than 3. The Jarque-Bera test for normality is also estimated. It indicates that all the variables of interest are normally distributed because their p- values are greater than 5%.

Unit root test

Table 2 unit root test

	Test at level		**Test at first difference**		Order of Integration
Variables	**ADF test**	**PP test**	**ADF test**	**PP test**	
LRGDP	-1.533013	-1.734253	-3.732983	-3.638298	I(1)
LMAOUP	-2.224014	-1.238214	-8.969196	-5.806368	I(1)
LAGROUP	0.889628	-2.738365	-1.908716***	-2.320061	I(1)
EXRATE	-3.435940	-3.802956	-5.122036	-5.109475	I(0)

Source: Researcher computation using E-views 10.
*Asterics*** *, ****indicates stationary at 5% and 10% level of significance.*

Table 2 presents the result of Augment Dickey Fuller (ADF) and Phillips Perron (PP) unit root test. It clearly shows that variables- real gross domestic product, manufacturing output and agricultural output- are stationery at first difference i.e are (I) process in both ADF and PP while exchange rate is stationery at level in both ADF and PP test i.e (0) process. Therefore, there is mixture of order of integration among the variables employed in the study.

Bound Test for Long run

Table 3: Result of cointegration Bound test

Statistics	**Value**		**Critical bound**			
F-statistics	7.125960**		1%	2.5%	5%	10%
		I(0) Bound	3.65	3.15	2.79	2.37
		I (1)Bound	4.66	4.08	3.67	3.2

Source: researcher computation using E-views 10.

From table 3, the result of cointegration bound test indicates a higher value of F-statistics than any of the critical values of all bounds. Therefore, there is a strong evidence of cointegration in the model. This provides evidence of adopting Autoregressive Distributive Lag model (ARDL) in the study.

Results of Autoregressive Distributed Lag (ARDL) model

Table 4: Short run parameters of the ARDL model

Variables	Coefficient	Std. Error	t-Statistic	Prob.**
D(LRGDP(-1))	0.372149	0.118407	3.142959	0.0078
D(LRGDP(-2))	-0.153545	0.121820	-1.260425	0.2297
D(LRGDP(-3))	-0.472262	0.117985	-4.002743	0.0015
D(LMAOUP)	0.045463	0.029660	1.532788	0.1493
D(LMAOUP(-1))	-0.036943	0.035989	-1.026497	0.3234
D(LMAOUP(-2))	0.189316	0.042284	4.477287	0.0006
D(LMAOUP(-3))	-0.066456	0.033200	-2.001709	0.0666
D(LAGROUP)	-0.012293	0.032214	-0.381592	0.7089
D(LAGROUP(-1))	-0.136450	0.027846	-4.900123	0.0003
D(LEXRATE)	0.000190	0.010849	0.017538	0.9863
D(LEXRATE(-1))	-0.010060	0.011543	-0.871464	0.3993
D(LEXRATE(-2))	-0.024062	0.011027	-2.182223	0.0480
D(LEXRATE(-3))	0.069850	0.016624	4.201756	0.0010
R-squared	0.999360			
Adjusted R-squared	0.998524			
Serial correlation	0.0010			
Heteroscedastics	0.1982			
Normality	0.475824			
Ramsey test	0.3375			

Source: researcher computation using E-views 10.

The result from table 4 indicates positive and significant autoregressive of real gross domestic product at lag 1 and lag 3, while lag 2 it is negative and insignificant, it shows that gross domestic product depend largely on itself in the short run. Manufacturing output itself indicates positive but statistically insignificant impact on real gross domestic product in Nigeria in the short run, at lag 1 and 3 it is negative and statistically insignificant while lag 2 it is positive and statistically significant impact on real gross domestic product. Agricultural output shows negative and statistically insignificant impact on real gross domestic product in Nigeria in the short run, at lag 1 it is negative also but statistically significant impact on real gross domestic product in Nigeria. Exchange rate itself shows positive but statistically insignificant impact on real gross domestic product in Nigeria in the short run, at lag 1 it is negative and statistically insignificant, at lag 2 it is negative but statistically significant while lag 3 it is positive and statistically significant on real gross domestic product in Nigeria in the short run. The R-squared and its adjusted value are very high 0.999360; this implies that 99% change in real gross domestic product is explained by manufacturing output, agricultural output and exchange rate in Nigeria. The model passed all post estimation test such as Heteroscedasticity, normality test, Ramsey reset test as their probability values are greater than 5% except for serial correlation test.

Table 5: ARDL Cointegration and Long run form Result

Variables	Coefficient	Std. Error	t-Statistic	Prob.**
LMO	0.484165	4.472005	0.779106	0.4499
LAG	0.062674	3.021625	0.682637	0.5068
LEX	-0.306964	1.842717	-0.709259	0.4907
CointEq(-1)*	-0.031580	0.004626	-6.825893	0.0000

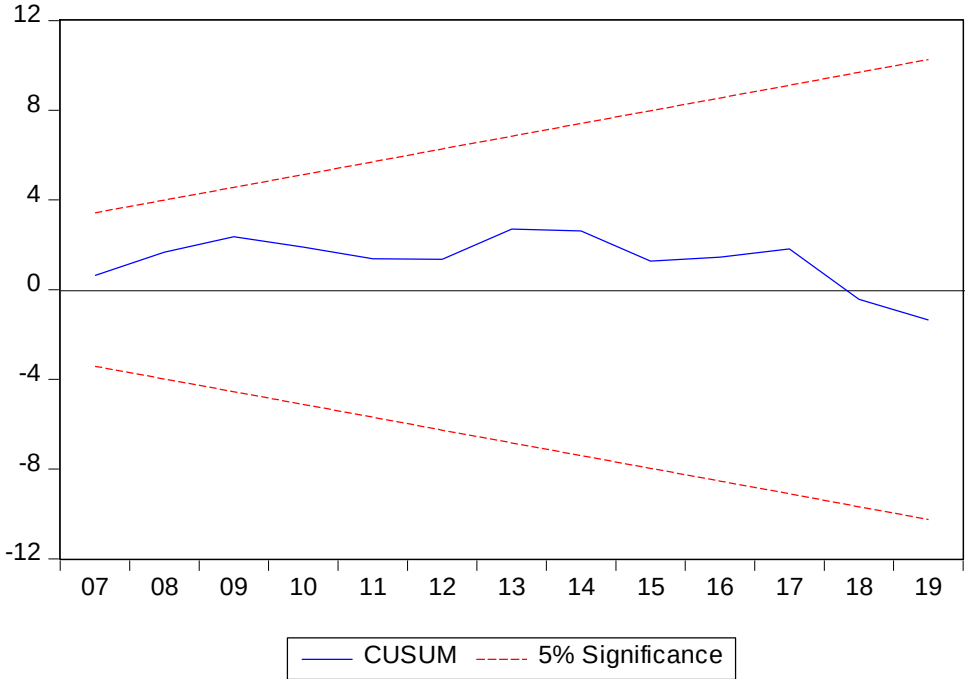
Source: Researcher computation using E-views 10.

The result from table 5 indicates that manufacturing output is positive but statistically insignificant impact on real gross domestic product in Nigeria in long run, the positive findings is line with apriori expectation which assumed to be a positive relationship between manufacturing output and real gross domestic product in Nigeria. This implies that when manufacturing output increase the real gross domestic product in Nigeria will also increase and vice-versa. Furthermore, agricultural output shows positive but statistically insignificant impact on real gross domestic product in Nigeria in long run, the positive findings is line with apriori expectation which assumed to be a positive relationship between agricultural output and real gross domestic product in Nigeria. This means that when agricultural output increases the real gross domestic product in Nigeria will also increase and vice-versa. Exchange rate indicates negative and statistically insignificant impact on real gross domestic product in Nigeria in long run, this means that real gross domestic product is decreasing with the increase in exchange rate in Nigeria. The negative finding counter the apriori expectation which assumed to be a positive relationship between exchange rate and real gross domestic product in Nigeria.

The error correction term (ECT) meets all the theoretical and statistical requirements both in the sign and size. The ECT coefficient is -0.031580and significant at 5%, this indicates that at 3.15% of the disequilibrium due to the shock in the previous years is adjusted back to the long run equilibrium in the current year.

Stability

Figure 1 cusum plot recursive residual of ARDL model



Source: researcher computation using E-views 10.

From figure 1, the cusum plot is within 5% level of significant, this means that the model is stable, it implied that there is no chance of having spurious regression.

Conclusions and Recommendations

The study examines the impact of manufacturing sector on economic growth in Nigeria using time series data from 1985 to 2022. Data was subjected to unit root tested using Augmented Dickey Fuller and Phillips Perron, the test showed that real gross domestic product, manufacturing output and agricultural output are stationery at first difference while exchange rate is stationery at level. From the Auto regressive Distributive Lag (ARDL) model result it indicated that in the short run, manufacturing output has positive but statistically insignificant impact on real gross domestic product, at lag 1 and 3 it is negative and statistically insignificant while lag 2 it is positive and statistically significant impact on real gross domestic product. It further revealed that agricultural output has negative and statistically insignificant impact on real gross domestic product in Nigeria, at lag 1 it is negative also but statistically significant impact on real gross domestic product in Nigeria. Exchange rate itself has positive but statistically insignificant impact on real gross domestic product, at lag 1 it is negative and statistically insignificant, at lag 2 it is negative but statistically significant while lag 3 it is positive and statistically significant on real gross domestic product in Nigeria. From the long run coefficient it found that manufacturing output has positive but statistically insignificant impact on real gross domestic product. Also, agricultural output has positive but statistically insignificant impact on real gross domestic product. Exchange rate has negative and statistically insignificant impact on real gross domestic product in Nigeria. The ECT coefficient is -0.031580 and significant at 5%, this indicates that at 3.15% of the disequilibrium due to the shock in the previous years is adjusted back to the long run equilibrium in the current year. The study recommended that government should make

adequate foreign exchange available to manufacturers in order to acquire raw materials at cheaper cost for production. It further recommends government to improve resource allocation to the field of research and development so as to promote innovative development such as technology adaptation to boost manufacturing activities and agricultural product in the country.

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