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Article

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National Domestic Savings, Inflation, Exchange Rate and Manufacturing Sector in Nigeria: ARDL Approach

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Abstract: This research work centered on national savings, exchange rate, inflation, and manufacturing sector in Nigeria from 1985 to 2018, a period of 34years. Data was sourced from CBN statistical bulletin various issues up until 2017 and National Bureau of Statistics (NBS), 2018 Statistical Bulletin, on manufacturing sector output, national savings, Exchange Rate and inflation. Data were analyzed using Autoregressive Distribution Lag (ARDL) to examine the effect of national savings, exchange rate and inflation on manufacturing sector. The ARDL result revealed that national savings has no short run effect on the manufacturing sector output but has effect on the longrun on the manufacturing sector. The exchange rate has a positive effect on the long run, but a negative effect on the shortrun on the manufacturing output, while the inflation rate has a negative relationship with the manufacturing sector output. The empirical findings showed that that national savings is not enough to alleviate investment in the manufacturing sector. Hence, it was recommended that the government comes up with policies that will encourage foreign direct investment in the manufacturing sector and raw materials for this sector should be sort for domestically.

Keywords: Manufacturing output, National savings; inflation; ARDL

JEL Classification: O14; P24; C41; E13

1. Introduction

Manufacturing sector is a sub set of the industrial sector (others being processing, craft, and mining subsector). Manufacturing sector, hence, involves the transformation of raw materials into finished consumer goods or intermediate or producer goods. Manufacturing, like other industrial activities, creates avenues for employment, helps to boast agriculture, diversify the economy, while helping the nation to increase its foreign exchange earnings, and enabling local labour to acquire skills. In addition, it minimize the risk of over dependence on foreign trade and leads to fullest utilization of available resources (Anyanwu, 2004).

Shuaib, Igbinosun, and Ahmed, (2015) stated that countries that are able to accumulate high level of capital tend to achieve fast rates of economic growth and development. Secondly, the quality of the government and its economic policies matter a lot. The radical theorist and early proponents of development economics were of the view that growth could be internalized. Developments in the world economies have shown that it is futile for economies to isolate themselves from rapidly integrating world (Eregba and Irugbe, 2009).

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Therefore, to finance adequate investment, required for proper economic growth, every economy needs to generate sufficient savings or borrow from abroad. However, borrowing from abroad is not proper strategy for economic growth, as it may not only have adverse effects on the balance of payment as the loans will have to be serviced in the future, but also carries foreign exchange risks, national savings becomes necessary for economic growth, because, they can provide the domestic resources that are needed to fund the investment effort of a country (Gotera, 2002). Savings which is defined as that part of income not immediately spent or consumed but reserved for future consumption, investment or for unforeseen contingencies, is considered as an indispensable instrument for economic growth and development. Its role is reflected in capital formation through increase capital stock and the impact it makes on the capacity to generate more and higher income.

Controlling inflation and exchange rate distortions over the years have gained much attention of policy makers in Nigeria. Inflation targeting is now one of the main policy focus of policy makers since the issue of inflation control is intractable. Given the important role the manufacturing sector plays, effort are made to examine the influence of inflation on the output of the sector to aid policy making. The few empirical works that have examined the link between inflation and the manufacturing sector output have produced diverse findings.

Manufacturing in Nigeria is tied to foreign exchange earnings for the purchase of capital equipment. Even the massive inflows of foreign exchange between 1970s and 1990s through crude oil sales could not provide the necessary stimuli for development in the manufacturing sector as it failed due to over dependence on external sector for the supply of inputs in the face of fast technological driven development. In addition, there was a weak demand for the sectors products and low export market. Consequently, the manufacturing sector did not record an impressive performance in the local sourcing of raw materials despite various incentives given by the government with the associated increase in foreign exchange receipts as time progresses (Akinmulegun and Falana, 2018). Hence, the objective of the study is to contribute to existing literature the area of manufacturing sector productivity by examining the effect of national domestic savings, inflation and exchange rate on manufacturing sector productivity.

2. Literature Review

There are several economic theories with divergent opinions about the sensitivity or reaction of output growth to inflation. The supply-aggregate demand framework explains that there is a positive relationship between inflation and output growth. In other words, when output increases inflation increases as well and viz (Modebe and Ezeaku, 2016). However, the distinct phenomenon of stagflation (persistent high inflation in addition to unemployment and stagnant demand for goods and services in a country's economy) came into prominence in the 1970s and the validity of positive relationship earlier suggested was questioned (Mbutor, 2014). Arriving at a common consensus seems very unlikely as findings reveals that the nature of the relationship between output growth and inflation is country specific, and depends also on the methodology used to determine such relationship.

According to Akinbobola & Ibrahim (2011), higher savings leads to higher investment, which in turn leads to higher economic growth (Lewis, 1955). The Harrod-Domcar model proposed by Harrod (1939)

and Domar (1946) postulates that savings, as the major determinant of economic growth, depends on marginal propensity to save and capital output ratio (cited in Stephen & Obah, 2017).

It is widely agreed on one side that countries that save more also tend to grow faster provided the financial system is deep while on the other hand, some analysts fear that a rising savings rate could hamper economic recovery if consumer expenditures from a large component of aggregate demand. Low savings rate has been cited by some study as one of the most serious constraints to sustainable economic growth, one of those studies is that of World Bank that concludes that on the average, third world countries with higher growth rates incidentally are those with higher saving rates (World Bank, 1989). This makes savings, as a macroeconomic variable to attain economic growth, a subject of critical consideration.

Opaluwa, Umeh and Abu (2010) examined the impact of exchange rate fluctuations on the Nigerian manufacturing sector during a twenty (20) year period (1986 – 2005). The econometric tool of regression was used for the analysis. Using data from 1986 to 2005, the estimated model used e-views software package. The finding of this study is that fluctuations in the rate of exchange are not favourable to economic activities in the manufacturing sector. It was discovered that the performance of the manufacturing sector was affected by factors such as high cost of foreign exchange for procuring raw materials and machineries required for production, availability of financial capital, technological underdevelopment, inadequate socio-economic infrastructure, shortage of technical manpower and foreign domination; following the implementation of exchange rate devaluation; the manufacturing sector has not performed any better because of the influence of the earlier mentioned factors which affect the manufacturing sector performance.

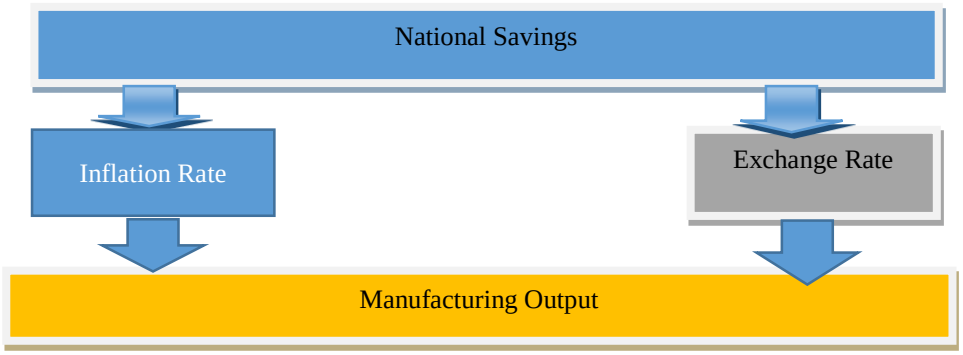
Lawal (2016) stated, in her study on the effect of exchange rate fluctuation on manufacturing sector output in Nigeria, that exchange rate fluctuations have long run and short run relationship on manufacturing sector output. The result showed that exchange rate has a positive relationship on manufacturing sector output but not significant. However, from the empirical analysis it was discovered that exchange rate is positively related to manufacturing sector output.

Bans-Akutey, Deh, and Mohammed (2016), using annual time series data for Ghana, current study investigates the effect of inflation on manufacturing sector productivity for the period 1968-2013. The empirical verification is done by using the Johansen test (JT), the Vector Error Correction Model (VECM), and the Ordinary Least Squares (OLS) regression test. The results indicate significant stable long run relationship between inflation and manufacturing sector productivity. However, there is insignificant short run link between inflation and manufacturing sector productivity in the VECM. The results of the OLS test indicate negative significant link between inflation and manufacturing sector productivity. The findings suggest that inflation has led to a decrease in manufacturing sector productivity.

Ojeyinka and Adegboye (2017) reveal, in their findings, that both exchange rate and inflation have negative impact on manufacturing sector's output within the study periods of 34years (1981-2014). Contrary to Ojeyinka and Adegboye (2017), earlier study by Ehinomen and Oladipo (2012) revealed that there is a positive relationship between the manufacturing gross domestic product, inflation and exchange rate in Nigeria.

From the reviewed literature it could be deduced that studies, though few of the studies were conducted on the inflation rate and exchange on the manufacturing sector in different methods, known have been able to relate inflation rate, exchange rate and national savings on the manufacturing sector of Nigeria and this is the gap this study intends to cover.

2.1. Conceptual Model of the Endogenous and Exogenous Variables



Source: Author's Model, 2019

The model was formulated to reveal the link that exists among the variables of interest. Hence, there is a direct relationship between national savings and the manufacturing output, while exchange rate and inflation rates have indirect relationship with manufacturing output. This conceptual model is the direction of study of this research work, which will bring about the casualty of these endogenous variable on the exogenous variables using Grander Causality test.

3. Methodology

3.1. Theoretical Framework

To actually reveal the role of the national savings, exchange rate and inflation on the Nigeria manufacturing sector this study employed the neoclassical growth model production function

$$Y = AF(K, L) \quad \ldots\ldots (1)$$

Where Y is Gross Domestic Product (GDP), K is the stock of capital, L is the amount of unskilled labour and A is exogenously determined level of technology. It is revealed that change in this exogenous variable, technology, will cause a shift in the production function.

There are two ways in which technology parameter A is incorporated in the production function. One popular way of incorporating the technology parameter in the production function is to assume that technology is labour augmenting and accordingly the production function is written as

$$Y = F(K, AL) \quad \ldots\ldots (2)$$

Here, the labour-augmenting technological change implies that it increases productivity of labour.

The second important way of incorporating the technology factor in the production function is to assume that technological progress augments all factors (both capital and labour in our production function) and not just augmenting labour. It is based on this that the production function equation (i) above is written in this way as:

$$Y=AF(K, L) \quad \text{(3)}$$

Considering in this way A represents total factor productivity (that is, productivity of both factor inputs). When we empirically estimate production function specified in this way, then contribution of A to the growth in total output is called Solow residual which means that total factor productivity really measures the increase in output which is not accounted for by changes in factors, capital and labour.

Looking at the neoclassical production function, labour and capital are the major factors that determine increase in output. Hence, this study will introduce other variables that have influence on the aggregate output of the manufacturing sector in Nigeria. These include; inflation rate, exchange rate, and national savings.

3.1. Model Specification

The Solow growth model is symbolically represented below:

$$Q = (K, L) \quad \textbf{(4)}$$

Where Q is the national output, K represents capital resources employed and L for unit of labour employed in the production process. Since the focus of this paper is based on the influence of national savings, exchange rate and inflation, therefore national savings, exchange rate and inflation are factors that explain growth for this study. The output (growth) model specified for the purpose of this study considered a sub-sector of the Real Gross Domestic Product, Manufacturing sector is presented thus:

$$RMGDPt = (\text{NS}t, \text{EXC}t, \text{INF}) \quad \textbf{(5)}$$

Where: $RMGDPt$ = Real Manufacturing- GDP at time *t*, NS t = National Savings at time *t*, EXCt= Exchange Rate at time t, INFt = Inflation Rate at time *t*,

$$\text{LMGDP} = \beta_0 + \beta_1\text{LMGDP}(-1) + \beta_2\text{LNS} + \beta_3\text{LNS}(-1) + \beta_4\text{LNS}(-2) + \beta_5\text{EXC} + \beta_6\text{EXC}(-1) + \beta_7\text{EXC}(-2) + \beta_8\text{EXC}(-3) + \beta_9\text{INF} + \mu \quad (6)$$

3.4. Data Sources and Measurements

The study used time series data for manufacturing sector contribution to the real GDP, national savings, exchange rate and inflation in Nigeria from 1985 to 2018. The data were obtained from the CBN statistical bulletin various issues up until 2017 and National Bureau of Statistics (NBS) 2018 Statistical Bulleti.

3.3. Estimation Technique

The first phase consists of pre-estimation evaluation, These are the preliminary evaluation of the data using the descriptive statistics method in order to help show, describe and summarize the data in a meaningful way and also to know if the data are normally distributed through their various averages and Jarque-Bera values (Gujarati & Dawn, 2009) cited in (Oseni and Adekunle, 2017). The second step is the determination of the stability of the variables. For the purpose of this research Augmented Dickey-fuller (ADF) unit root tests was deployed. This test of the time series data is required because a non-stationary regressor invalidates many standard empirical results. The presence of a stochastic trend is determined by testing the presence of unit roots in time series data. (Oseni and Adekunle, 2017). The next was the Autoregressive Distributive Lag analysis which was based on the order of integration of the variable series

The third phase is the post estimation. In order to confirm the robustness and validity of regression model, a post-estimation test was conducted, which was ARDL Bound Test to test for the existence of a long run relationship among the variables.

4. Empirical Result

4.1. Descriptive Statistic, Normality Test and Correlation Matrix

Table 1. Descriptive Statistics of the Data

	MGDP	EXC	INF	NS
Mean	2872.586	95.60118	19.48382	1189432.
Median	1821.574	94.42500	12.44000	122735.0
Maximum	6684.218	306.4000	70.97000	8062901.
Minimum	1373.662	0.740000	0.270000	1.000000
Std. Dev.	1831.158	83.88924	18.94696	2196624.
Skewness	1.137728	0.907531	1.513074	1.968045
Kurtosis	2.719794	3.368220	3.957543	5.517042
Jarque-Bera	7.446311	6.859216	14.27215	30.92343
Probability	0.024158	0.038071	0.000796	0.000000
Sum	97667.91	3250.440	662.4500	40440699
Sum Sq. Dev.	1.11E+08	232234.3	11846.58	1.59E+14
Observations	34	34	34	34

Source: Authors computation (E-views), 2019

Table 1 shows that the mean and median of all the variables lie within the maximum and minimum values. This indicates that the data are normally distributed. All the variables (MGDP, EXC, INF, NS) are positively skewed and real GDP are negatively skewed. The kurtosis statistics showed that MGDP, EXC, INF, and NS were leptokurtic, suggesting that their distributions were normal distribution. The Jarque-Bera statistics shows that the series are normally distributed since the p-values of all the series are individually statistically significance at 5% level. Thus informing the acceptance of null hypothesis that says each variable is normally distributed.

Table 2. Correlation Matrix of the Data Set

Correlation	MGDP	EXC	INF	NS
MGDP	1.000000			
EXC	0.869203	1.000000		
INF	-0.322105	-0.507486	1.000000	
NS	0.195509	0.259526	-0.214848	1.000000

Source: Authors computation, 2019

Furthermore, studies have argued that testing of the correlation among the variables of estimates would make the researchers detect whether the variables have high multicollinearity among themselves. As a result, the parameter estimates may contradict what the theory says due to the unexpected effect of multicollinearity among the independent variables (Agung, 2009; Hamsal, 2006 as cited in Oseni, 2016). However, multicollinearity among variables only occur when the result of the correlation coefficient is above 0.95 (Iyoha, 2004). Against the background, the results of the correlation analysis of table 2 above shows that the correlation coefficients among the variables, MGDP, EXC, INF NS are below 0.95 which shows that there is no trace of multicollinearity among the independent variables.

Time Series Properties of the Variables

The ADF test is used to test for stationarity of the data.

The study employed Augmented Dickey-Fuller to ascertain the order of integration of the variables. It was observed that MGDP, EXC and INF variables were stationary at first difference I(1), while NS is stationary at level I(0) at 5% significance level, hence this necessitating the use of Autoregressive Distributive Lag (ARDL)

Table 5. Autoregressive Distributed Lag

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
IMGDP(-1)	0.876170	0.043148	20.30635	0.0000
EXC	-0.001121	0.000594	-1.888397	0.0729
EXC(-1)	0.000645	0.000919	0.701513	0.4907
EXC(-2)	0.000701	0.000995	0.704103	0.4891
EXC(-3)	0.001313	0.000590	2.225927	0.0371
INF	-0.000226	0.000605	-0.374057	0.7121
INS	-0.003578	0.005194	-0.688852	0.4985
INS(-1)	-0.000328	0.005707	-0.057515	0.9547
INS(-2)	0.013003	0.005517	2.356858	0.0282
C	0.804464	0.315322	2.551248	0.0186
R-squared	0.995068	Mean dependent var		7.853365
Adjusted R-squared	0.992955	S.D. dependent var		0.548765
S.E. of regression	0.046061	Akaike info criterion		-3.062001
Sum squared resid	0.044554	Schwarz criterion		-2.599425
Log likelihood	57.46102	Hannan-Quinn criter.		-2.911213
F-statistic	470.8001	Durbin-Watson stat		2.341036
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent tests do not account for model selection.
Source: Authors computation (E-views), 2019

Based on the fact that the time series are not of the same order, it is therefore pertinent to employ the use of Autoregressive Distributive Lag (ARDL). Co-integration is concerned with the analysis of long-run relations between variables integrated of the same order (i.e. series made stationary at the same order of differencing) (Olanrewaju, Raphael and Olaoluwa, 2012). This raises another short fall in analyzing and establishing long run relationships, the co-integration test is not applicable in cases of variables that are integrated of different orders (for example, if series-A is I(1) and series-B is I(0)). A distributed-lag model is a dynamic model in which the effect of a regressor X on Y occurs over time rather than at once.

The result of table 5 shows that there are significant effects of the lag one of the LMGDP, lag three of the exchange rate, and the lag two LNS on the LMGDP. The result reveals that there is a significant positive effect of the first lag, second lag, and third lag of LMGDP, LNS and EXC on the LMGDP, while first lag, second lag, and third lag of LMGDP, LNS and EXC are significantly positive, the remaining variables are not significant. From this result, it could be deduced that MGDP in the previous periods still affect manufacturing output in the current. It was also revealed that the exchange rate and the national savings have significant influence on the manufacturing sector in the long run.

The value of the adjusted R^2, of 0.993 indicates that 99.3% of variations in MGDP is explained by national savings, exchange rate, and inflation rate while the remaining .7% are captured outside the model. The value of Durbin Watson is 2.34 for the model. This implies that there no serial correlation among the variables. The F-statistics of 470.8001 is statistically significant at 1 percent level, indicating that the explanatory variables are jointly significant suggesting that the model has a very good fit.

Bounds Testing Approach

The first step in the ARDL bounds testing approach was to estimate equation in order to check if there is a long run relationship among the variables by conducting bound-test for the joint significance of the coefficients of the lagged levels of the variable, that is:

H0: $\delta 1 = \delta 2 = \delta 3 = 0$

Table 6. ARDL Bounds Test

Test Statistic	Value	k
F-statistic	11.10809	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Note: Asymptotic critical bounds are obtained from the table 6 above, if the value of F-statistics is higher than the upper bound critical value at 1%,2.5%,5% and 10% level, the null hypothesis of no cointegration is rejected implying the long run cointegration relationship amongst the variables.

From the above, the bound tests F-statistics value (11.10809) is higher than the upper bound critical value at 1%,2.5%,5% and 10% level of significant, therefore the null hypothesis of no cointegration is rejected. Hence, there is a long run relationship amongst the variables.

Following the establishment of a long run co-integration relationship, the functional equation estimated is:

$$LMGDP = C(1)*LMGDP(-1) + C(2)*LNS + C(3)*LNS(-1) + C(4)*LNS(-2) + C(5)*EXC + C(6)*EXC(-1) + C(7)*EXC(-2) + C(8)*EXC(-3) + C(9)*INF + C(10)$$

Table 7. Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
EXC does not Granger Cause IMGDP	32	4.28683	0.0242
IMGDP does not Granger Cause EXC		5.66147	0.0088
INF does not Granger Cause IMGDP	32	2.24052	0.1258
IMGDP does not Granger Cause INF		1.25374	0.3015
INS does not Granger Cause IMGDP	32	2.10017	0.1420
IMGDP does not Granger Cause INS		7.23256	0.0031

From the granger causality test in table 8 , it was indicated that there is bi-directional causality between the exchange rate and the manufacturing output which implies that the Exchange rate Granger cause manufacturing output and the manufacturing output also Granger cause Exchange rate since their P-value are less than 0.05 respectively, the null hypothesis is rejected, there is no causality between the inflation and the manufacturing output while there is uni-directional causality with the national savings and manufacturing output

5. Conclusion and Recommendation

This study empirically confirmed the effect of national savings, exchange rate and inflation on the manufacturing sector output. It was discovered that at the short run the national savings has no significant effect on the manufacturing sector output, it however, had effect at the long run on the manufacturing sector output. This findings is in line with the findings of Akinbobola and Ibrahim, 2011. The exchange rate also has a positive, though was negative in the short run, effect on the manufacturing sector output, nevertheless not significant. However, the empirical evidence revealed that exchange rate is positively related to the manufacturing sector, this is also in line with Lawal (2016) and Ehinomen and Oladipo (2012), but in contrary the findings of Ojeyinka and Adegboye (2017). The empirical evidence shows that inflation rate has negative relationship with the manufacturing sector output, both at the short and long run. This was in agreement with the findings of Ojeyinka and Adegboye (2017). Hence, the empirical evidence has shown that national savings is not enough to alleviate investment in the manufacturing sector.

Based on these empirical findings, it is therefore pertinent that the government comes up with policies policy that will encourage foreign direct investment in the manufacturing sector and the materials for this sector be sought for domestically.

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