

# Impact of Exchange Rate Deregulation on Manufacturing Sector Performance in Nigeria

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**Abstract**— The study examined the impact of exchange rate deregulation on manufacturing output performance in Nigeria over the period 1980 to 2016. The normalized co-integration technique was used to test for long-run relationship between exchange rate and manufacturing output while the granger causality test was used to ascertain the direction of causality between them. Also, the error correction mechanism (ECM) was used to calculate the speed of adjustment of the model to short-run disequilibrium condition. The empirical findings revealed that exchange rate has non-significant positive long-run effect on manufacturing industry output. However, unidirectional causal impact of exchange rate on manufacturing output was established using the pairwise granger causality test. Based on the above result, it is recommended that in discharging the mandate of exchange rate management, the monetary authorities should aim at stabilizing exchange rate through the use of appropriate monetary policy tools as well as support export diversification programmes in order to enhance foreign exchange inflow.

**Keywords**— Exchange rate, Manufacturing output, Exchange rate management, Monetary policy.

## I. INTRODUCTION

In modern economies, the manufacturing sector is generally regarded as capable of accelerating the growth and development process. One major reason for this is the nature of activities in the sector which is believed to involve significant linkages across other sectors in terms of contribution to and from these sectors (Okigbo, 1993; Opaluwa, Umeh, and Ameh, 2010). However, the manufacturing sector in Nigeria is still under-developed, with very low level of capacity utilization and contribution to aggregate output in spite of the fact that it is considered the fastest growing sector in Nigeria since 1973/1974 (Ojo, 1990; Obadan, 1994). Low level of development in the sector

has often been attributed to increasingly dependence on the external sector for import of essential manufacturing inputs (Okigbo, 1993). Inability to source foreign exchange at affordable rates can impair the capacity to import, thereby impacting negatively on manufacturing performance.

The structural adjustment programme (SAP) which was adopted in 1986 to restructure the Nigerian economy led to an increase in agricultural output but also had negative effect on the manufacturing sector (International Labour Organization, 1996). SAP entailed the deregulation of prices (including exchange rate) which led to unstable and rising trends in the general price level. This unintended consequence of SAP led to de-industrialization and rising unemployment in the economy. It should be noted that after 28 years of exchange rate deregulation as entrenched in SAP, the industrialization process in Nigeria is still very slow while unemployment is on the increase. Iyoha (2003) noted that the decline in manufacturing contribution to GNP showed that SAP, indeed, impacted adversely on the operations of the manufacturing sector in Nigeria. The relative share of industrial output in GDP achieved a high level of 45.57 percent in 1980 and a low level of 26 percent in 1986. With the adoption of SAP, the manufacturing sector's relative share of national output declined even further, reaching a low level of 5.2 percent in 1989. Manufacturing capacity utilisation fell from about 73.3 percent in 1981 to 38.3 percent in 1985. This translates to a decline of about 45 percent. It further reduced from 38.1 percent in 1992 to an all-time low of about 29.29 percent in 1995 and has not exceeded an annual average of 57 percent up to 2010 (CBN, 2015; Achugamonu, 2017)

For an open economy that depends on importation to support domestic production, exchange rate plays a critical role in its ability to attain optimal production capacity. Thus, exchange rate fluctuations/uncertainty which attended the introduction of exchange rate deregulation had serious implications for

the macroeconomic stability of the country. For example, an over-valued exchange rate hurts the performance of export industries thereby reducing foreign exchange inflow, leading to unsustainable balance-of-payments deficits. On the other hand, excessive devaluation of the domestic currency or depreciation of the exchange rate increases the cost of imported production inputs thereby fuelling inflationary pressures. The Nigerian manufacturing sector imports most of its industrial inputs thereby raising the cost of production. This discourages investment in the sector and in the process retards manufacturing sector output growth.

Based on the above background, this study examined the performance of the manufacturing sector in the post exchange rate deregulation period in order to ascertain the extent to which deregulation has affected the contribution of the manufacturing sector to the economy. Estimation techniques of the Johansen normalized co-integration and Granger causality were employed in the study. The error correction mechanism (ECM) was used to determine the speed of adjustment of the model in the case of a disequilibrium in the system.

## II. INSIGHTS FROM LITERATURE.

Preservation of the value of the domestic currency, maintenance of favourable external reserve position and attainment of both internal and external balance, among others, are major objectives of exchange rate management in Nigeria. Exchange rate policy is an essential component of macroeconomic management in Nigeria because the dynamics of exchange rate have significant implications for a country's balance of payment position, income distribution and growth (Oyejide and Ogun, 1985). It is often argued that the behaviour of exchange rate determines the behaviour of several other macroeconomic variables (Oaikhenan and Edo, 2002). Exchange rate movements, for instance, affect other indicators of a nation's economic health like interest rate, inflation rate, unemployment rate, term of trade (Douglas and Jike, 2005). Hence, exchange rate which is a measure of the strength of a currency relative to another currency or a group of currencies is both an instrument of macroeconomic management and an indicator of macroeconomic performance.

Abdullahi (1981) and Ammani (2011) observed that after many years of independence, Nigeria could neither produce sufficient consumer goods for its rapidly increasing population nor provide for the raw material needs of agro-based industries like oil mills, textile and paper mills, the furniture industry etc. let alone producing for export. Indeed, many of the agro-based industries are either closing shop or are operating at sub-optimal levels due to inability to import

part or all of the raw materials required to support their operations. In addition, other performance assessment indicators suggest that the country was in need of a structural reform and it was against this background that the structural adjustment programme (SAP) was introduced in 1986 to address perceived structural imbalance arising from over-dependence on both consumer and industrial goods imports.

Ahmed and Lipton (1997) opined that structural adjustment refers to a set of measures designed to fast-track or accelerate the process of economic development through correction of structural imbalance in an economy. The World Bank and IMF often emphasize such measures as conditions for financial support. These reforms aim at eliminating distortions such as currency overvaluation, high fiscal deficits, trade restrictions and inefficiencies in public service delivery which impair efficiency in allocation of economic resources. The structural adjustment programme (SAP) derived from the Washington consensus or agreement was adopted in the mid-1980s to restructure and redirect the Nigerian economy, eliminate price distortions and diversify its productive base. This was a follow-up to earlier failed attempts to lift the country out of the adverse macroeconomic condition that confronted it in the early part of that decade. Exchange rate deregulation was a major policy instrument of the structural adjustment programme.

However, exchange rate deregulation had unintended consequences on the Nigerian economy thereby bringing to question whether it was indeed a suitable option for Nigeria at the time it was introduced (Ude, 1996). The consequences, according to Osisioma (2004), include a general hike in prices of most finished goods, low aggregate demand for manufactured goods, accumulation of inventories of unsold finished products, and production cut-backs. Uche (2000) attributed the failure of the deregulated regime to the promotion of economic stability and jump-start the growth process of non-oil sectors, like manufacturing, largely, to lack of fiscal discipline and deficit budgeting. Also, Oyejide (1985) and Umubanmwun (1993) emphasized the adverse consequences of the Bretton Woods system which induces variability in the exchange rate and which also reduces the ability to import on the country that adopts Washington Consensus. Drawing from the above scenario, Anyanwu, Oyefusi, Oaikhenan, and Dimowo (1997) argued that currency devaluation, occasioned by exchange rate deregulation has not significantly affected economic performance positively in Nigeria. An assessment of the competitiveness of the real exchange rate constitutes a major component of a country's macroeconomic performance. Some developing nations are believed to have adopted currency devaluation as a policy option for boosting domestic export (Haddad and Pacavo,

2010). According to Sanger and Wines (2010), China effectively used this strategy to drive domestic production and enhance its export competitiveness.

Over the years scholars have examined the link between exchange rate and economic performance in both developed and developing economies but not many have focused on sectoral impact of exchange rate, particularly in a developing economy like Nigeria. Also, evidence from some of these studies have not been consistent. For instance, while studies by Enekwe, Ordu and Nwoha (2013), Adedokun (2012), Modebe, Okoye and Ahmed (2017), Okonkwo (2012), Okoye, Okorie and Nwakoby (2017) presented evidence of significant positive impact of exchange rate on manufacturing performance, others by Ayinde (2014), Maduabuchi and Ajudua (2014), Yaqub (2010), Arize, Osang and Slottje (2000) showed negative impact of exchange rate on the performance of the sector. However, studies by Opaluwa, Umeh and Ameh (2010), Lawal (2016), Akpan and Atan (2012) and Okoye, Nwakoby, Modebe and Okorie (2016) did not produce evidence that exchange rate has significant impact on manufacturing performance. Studies by Rodriguez and Diaz (1995), Rogers and Wang (1995), Berman, Martin and Mayer (2012) offer greater insight for a deeper understanding of the nexus between exchange rate and manufacturing output. These studies specifically showed the exchange rate depreciation is an impediment to manufacturing sector performance. A similar study by Ehinomen and Oladipo (2012) aligned with the outcome of the above studies. It showed that exchange rate appreciation supports manufacturing output growth. This result however contradicts Branson and Love (1988) which reported negative impact of exchange rate appreciation on manufacturing performance. In terms of causality, Okoye and Nwakoby (2015) established causal link from manufacturing capacity utilization to exchange rate, an indication that manufacturing operations in Nigeria affect exchange rate movements.

### III. SCOPE AND METHODOLOGY

The study covered the period 1980-2016. Quantitative technique of data analysis was adopted in investigating the relationship between the dependent variable (manufacturing output) and the independent variables (exchange rate, inflation rate, monetary policy rate, broad money supply, foreign direct investment, and market capitalization). Data for the study were obtained from secondary sources, specifically from CBN statistical bulletins (2016) and World Bank (2018).

#### 3.1: Model Specification

The model for the is specified in the implicit form as follows:

$$IND = f(EXRT, INFL, MPR, M2, FDI, MCAP) \quad (i)$$

Where:

IND = Manufacturing Industry output

INFL = Inflation

MPR = Monetary policy interest rate

EXRT = Exchange rate

FDI = Foreign direct investment

M2 = Broad money supply

MCAP = market capitalisation.

The above model can be re-specified explicitly as:

$$IND = EXRT^{\alpha_1} \cdot e^{\alpha_2 INFL} \cdot e^{\alpha_3 MPR} \cdot FDI^{\alpha_4} \cdot M2^{\alpha_5} \cdot MCAP^{\alpha_6} e \quad (ii)$$

The above model indicates that manufacturing industry output is a function of exchange rate, inflation rate, monetary policy rate, foreign direct investment (net inflows percentage of GDP), financial deepening and market capitalization. Inflation rate and monetary policy rate (interest rate) are exponential due to an intention to take the double log of the model for linearization purpose of which inflation and monetary policy are already smoothened. The variables are logged to ensure comparability of the variables on the same scale.

This, taking the log of the variables in order to ensure linearity in the equation, we have:

$$LIND_t = \alpha_0 + \alpha_1 LEXRT_t + \alpha_2 LINFL_t + \alpha_3 LMPR_t + \alpha_4 LFDI_t + \alpha_5 LM2_t + \alpha_6 LMCAP_t + u_t \dots \dots \dots (iii)$$

All the variables are as previously defined above.

From theory, the *a priori* expectation of the relationship between the independent variables and industrial output are as follows: exchange rate, inflation rate, and monetary policy rate are expected to have a negative and statistically significant relationship with industrial output such that an increase in exchange rate, inflation rate and monetary policy rate, will lead to a reduction in manufacturing industry output; market capitalisation, foreign direct investment and financial deepening are expected to have a positive and statistically significant relationship with manufacturing output.

#### 3.2: Technique of Estimation.

The Augmented Dickey Fuller (ADF) unit root test was conducted to test for stationary trend in the series because research has shown that time series data are often non-stationary and could produce spurious estimates (Granger, 1996; Popola, Ejemeyovwi, Alege, Adu, and Onabote, 2017). The null hypothesis of non-stationary trend is rejected if the AD Ftest statistic, at 5 per cent, is greater than or equal to the Mac Kinnon critical value, otherwise it is accepted (Popoola

*et al.*, 2017). The Johansen co-integration technique was used to establish evidence of long-run relationship among the variables. Evidence of co-integrating relationship is established if the trace statistic and or the Max Eigen-value statistic is equal to or greater than the critical value at 5 per cent.

The error correction (ECM) mechanism was used to ascertain short-run adjustment dynamics of the model. The ECM coefficient shows how quickly variables respond to short-run disequilibrium, should there be a disturbance to the model. The error correction technique corrects for short-run

disequilibrium by restoring or tying the value of the dependent variable to its long-run equilibrium. The Johansen normalized co-integration was conducted to determine the long-run effect of exchange rate on manufacturing output.

#### IV. RESULTS AND DISCUSSION

The results of the various tests are presented and discussed in this section as follows:

##### 4.1: Results of ADF unit root test

The result of the unit root test is shown in table 1 below:

Table.1: Unit root result

Variable	ADF t statistic value	Critical Value at (5 percent)	Order of Integration	Remarks
LIND	-5.1585	-2.9706	I(1)	Stationary
LEXRT	-5.0223	-2.9511	I(1)	Stationary
LFDI	-11.1674	-2.9511	I(1)	Stationary
INFL	-5.4164	-2.9511	I(1)	Stationary
LM2	-3.5699	-2.9540	I(1)	Stationary
MPR	-3.9245	-2.9798	I(1)	Stationary
DLMCAP	-4.0969	-2.9511	I(1)	Stationary

Source: Authors' Computation, 2018

Based on the ADF unit root test statistics, it was found that all the variables are non-stationary at level. However, stationary trend was achieved after taking the first difference at 5 per cent significance level. Given the stationary trend of all variables at their first difference (I(1)), investigation of the long run relationship using the

Johansen co-integration method was conducted. The results of the Johansen co-integration trace and max eigen value results are shown in tables 2 and 3 below:

##### 4.2: Co-integration Test

The result of the co-integration test is presented below:

Table.2: Johansen co-integration test result (Trace test)

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.811278	172.7168	134.6780	0.0000
At most 1 *	0.697398	116.0225	103.8473	0.0061
At most 2	0.493354	75.38096	76.97277	0.0657
At most 3	0.481034	52.26293	54.07904	0.0720
At most 4	0.328736	29.96174	35.19275	0.1644
At most 5	0.226530	16.40957	20.26184	0.1561
At most 6	0.202095	7.676041	9.164546	0.0951

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 2 shows that the trace statistic (172.72) is greater than 5% critical value (134.67) for the first equation and the same applies for the following equation. Hence, the null hypothesis of no co-integrating equation is rejected and the alternate hypothesis of co-integrating equations is accepted.

Table.3: Johansen co-integration test result (Max Eigen test)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.811278	56.69434	47.07897	0.0035
At most 1	0.697398	40.64150	40.95680	0.0542
At most 2	0.493354	23.11803	34.80587	0.5891
At most 3	0.481034	22.30119	28.58808	0.2574
At most 4	0.328736	13.55217	22.29962	0.5037
At most 5	0.226530	8.733526	15.89210	0.4629
At most 6	0.202095	7.676041	9.164546	0.0951

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 3 complements the result shown in table 2. Here, the Max-Eigen statistic (56.69) is greater than 5% critical value (47.07) for the first co-integrating equation. Though the other equations show the absence of or no co-integration, this is sufficient evidence of co-integration. Hence, a rejection of the null hypothesis of no co-integrating equations and acceptance of the alternate hypothesis of presence of co-integration.

#### 4.3: Long-run Estimation

Evidence of long-run response of manufacturing to changes in the explanatory variables is presented in table 4'

Table.4: Normalized co-integrating coefficients

Normalized co-integrating coefficients (standard error in parentheses)						
LIND	LEXRT	INFL	LMCAP	LFDI	MPR	LM2
1.000000	0.115737	0.012056	0.522986	-0.670851	-0.035878	-0.508188
	(0.08951)	(0.00104)	(0.06783)	(0.09817)	(0.00684)	(0.08379)
	1.2930	11.5923	7.7102	6.8332	5.2453	6.0650

Source: Authors' Computation, 2018

The long-run model estimation based on Johansen normalized co-integration test (table 4) shows non-significant positive effect of exchange rate ( $t=1.2930$ ) on manufacturing output at 5 percent level of significance. Exchange rate coefficient of 0.115737 implies that 1 percent increase in exchange rate will induce a less than proportionate increase in manufacturing output. Though this result is not consistent with *a priori* expectation, it explains the extent to which the nation's manufacturing sector depends on foreign imports for the sustenance and expansion of its operations.

The t-statistic for inflation rate (11.5923) and the coefficient (0.012056) indicate statistically significant positive effect of

inflation rate on manufacturing output. Specifically, 1 percent increase in capital will induce a less than proportionate percent increase in manufacturing output. This result also does not *a priori* expectation but it is an indication of low productive capacity of the sector. The estimates for market capitalization ( $t=7.7102$  and  $\alpha=0.522986$ ) show significant positive effect on manufacturing output, an indication that an increase in market capitalization enhances the capacity of the market to support manufacturing operations thereby raising the output of the sector. This is in agreement with *a priori* theoretical expectation.



For foreign direct investment, the t-statistic (6.8332) and a coefficient (-0.670851) indicate significant negative effect of foreign direct investment on manufacturing output. This outcome implies the foreign direct investment inflow leads to reduction in the output of the manufacturing sector. It is however not in agreement with theory.

The result further shows that monetary policy rate (proxied as interest rate) has significant negative effect on the output of the manufacturing sector such that if interest rate is raised by 1 per cent, there is a decline in manufacturing output by about 0.05 per cent. This outcome indicates that manufacturers react to high interest rates by borrowing less, thereby not being able to produce more or even maintain existing production level.

Finally, the result financial deepening (proxied as M2) shows statistically negative effect of broad money supply on manufacturing output performance. The coefficient of -0.035878 indicates that 1 per cent increase in money supply reduces manufacturing output by about 0.04 per cent. This does not agree with *a priori* expectation but it suggests diversion of monetary aggregates away from manufacturing, possibly to sectors that offer high and fast returns.

#### 4.4: Granger Causality Test

The granger causality was conducted to determine how changes in one variable affect the behaviour of the other variable. The results are presented in tables 5 and 6.

Table.5: Granger Causality Result 1

Pairwise Granger Causality Tests			
<b>Lags: 1</b>			
Null Hypothesis:	<b>Obs</b>	<b>F-Statistic</b>	<b>Prob.</b>
LEXRT does not Granger Cause LIND	35	13.8001	0.0008
LIND does not Granger Cause LEXRT		0.05905	0.8096

Table.6: Granger causality Result 2

Pairwise Granger Causality Tests			
<b>Lags: 2</b>			
Null Hypothesis:	<b>Obs</b>	<b>F-Statistic</b>	<b>Prob.</b>
LEXRT does not Granger Cause LIND	34	5.00701	0.0136
LIND does not Granger Cause LEXRT		0.04064	0.9602

Source: Authors' Computation, 2018

To ensure consistency in the result, the causal relationship between exchange rate and manufacturing output was examined using the pairwise granger causality method. The results of the analysis at lag one and two show that a significant unidirectional relationship exists between exchange rate and manufacturing output in Nigeria with causality running from exchange rate to manufacturing output. This implies that exchange rate significantly affects manufacturing sector output at 5 percent significance level.

Based on the result, the alternative hypothesis is accepted for the two results since the p-value of the f-statistics at lag 1 and lag 2 show (0.0008 and 0.013 respectively) are significant at 5% level of significance ( $> 0.05$ ).

#### 4.5: Error Correction Mechanism

To check for the ability of the model to adjust to short-run disequilibrium, the error correction mechanism model (ECM) was employed and the result is as presented in table 7.

Table.7: Short-Run Model– ECM Result

<b>Error Correction:</b>	<b>D(LIND)</b>	<b>D(LEXRC)</b>	<b>D(INF1)</b>	<b>D(LMCAP)</b>	<b>D(LFDIC)</b>
<b>CointEq1</b>	-0.415817	-0.996682	21.64445	0.682066	1.407051
	(0.13793)	(0.62770)	(68.8734)	(0.60530)	(0.93367)
	[-3.01478]	[-1.58783]	[ 0.31426]	[ 1.12682]	[ 1.50702]

Source: Authors' Computation, 2018

From the result, ECM is negative (-0.42). The speed of adjustment to equilibrium in its current period is about 42 per

cent This implies that about 42 per cent of the disequilibrium in the RGDP is offset by the short-run adjustment in each

period. The coefficient of adjustment of the ECM is correctly signed i.e. negative. It lies between the theoretical expectations (from -1 to 0). The negative sign indicates convergence in the long-run. Thus, the model will rightly act to correct any deviation of the dependent variable from its long-run equilibrium value.

## V. CONCLUSION AND RECOMMENDATIONS

The study examined the impact of exchange rate deregulation effects on manufacturing industry output in Nigeria. The unit root test revealed that all the variables attained stationary trend at first difference. The normalized Johansen co-integration technique was used to ascertain evidence of long-run relationship between the explanatory variables and manufacturing industry output. The empirical findings revealed that exchange rate has non-significant positive long-run effect on manufacturing industry output. However, unidirectional causal impact of exchange rate on manufacturing output was established using the pairwise granger causality test.

Based on the above findings, the study concludes that exchange rate deregulation policy has significant effect on the performance of the Nigerian manufacturing sector. Given that exchange rate has a significant relationship with manufacturing industry output, it is recommended that in discharging the mandate of exchange rate management, the monetary authorities should aim at stabilizing exchange rate through the use of appropriate monetary policy tools as well as support export diversification programmes in order to enhance foreign exchange inflow.

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