

Exchange Rate Management and Disaggregated Manufacturing Sector Output in Nigeria (1986-2019)

Rasak Adetunji ADEFABI

Department of Economics

Emmanuel Alayande College of Education, Oyo

ABSTRACT

This study investigated the effect of exchange rate management on disaggregated manufacturing sector output in Nigeria from 1986-2019. Secondary data used in the analysis were sourced from Central Bank of Nigeria Statistical Bulletin, (2020) and World Development Indicators, (2020). Stationarity and orders of integration of the variables were examined with both Augmented-Dicky-Fuller (ADF) and Philip-Perron (PP) unit root tests. Having disaggregated manufacturing sector output into oil and non-oil sources, two separate models emerged. The results of Autoregressive Distributed Lag (ARDL) Bound test for co-integration revealed that the variables under oil sector output model were co-integrated, while there was no evidence of co-integration in non-oil model. ARDL technique of estimation results showed that, both in the short-run and long-run, real exchange rates negatively and significantly impacted on oil manufacturing sector output, while real interest rate negatively and significantly influenced the dynamics of the sector in the short-run. In the non-oil model, it was found that, both in the short-term and long-term, real exchange rate negatively and significantly impacted on the sector, while inflation produced positive and significant effect. Authority in Nigeria should reduce the disparities between foreign and domestic currencies to improve on manufacturing sector performance.

Keywords: ARDL, exchange rate, management, manufacturing sector, Nigeria

INTRODUCTION

Manufacturing sector has become one of the key drivers of sustainable economic growth of modern economies with diverse benefits crucial for economic transformation and development. In most of modern economies, manufacturing sector serves as a catalyst for development of other sectors because it thrusts the production of goods and services which in turn generates new employment opportunities, leading to improvement in national income. According to Fakiyesi (2005), “manufacturing sector is a leading sector that increases productivity in relation to import substitution and export expansion, creating foreign exchange earnings, raising employment and promoting the growth of investments at a faster rate than any other sector of the economy, ... an efficient linkage among different sectors”. For instance, manufacturing sector is popular for its contributions to the growth of gross domestic product in economies like Japan, China, Singapore, India, South Korea and Taiwan (Orji, Ogbuabor, Okeke & Anthony-Orji, 2018). However, the failure or success of manufacturing sector’s performance, to a large extent, is a function of the optimal and stability of exchange rate

(Opaluwa, Umeh, & Abu, 2010; Abdul-Mumuni, 2016; Ayobami 2019). Exchange rate is the value of a country's currency that goes after other nations' currencies.

One of the fundamental features of a dynamic economy is her effective exchange rate with the particular objective of becoming industrialised nation. The realisation of this feat creates a problem except there is a mechanism through which such economy develops the efficiency of capital formation via exchange rate management to realise sustainable growth (Iyeli, & Utting (2017). Exchange rate is a significant macroeconomic variable used in determining the foreign competitiveness of a country. It is a veritable economic variable since its appreciation or depreciation influences the direction (negative or positive) and magnitude of performance of the entire sectors of the economy, most especially the manufacturing sector (Hashim, & Zarma, 1996; Odili, 2014). Since four decades ago, though with particular interest in exchange rate stability, Nigerian authority has adopted several policy measures which include import substitution, export promotion and interest rate deregulation with the objective of improving the manufacturing sector's productivities. This is with a view to bringing about rapid economic growth and development. Similarly, authority has been employing different exchange rate policy regimes to attract foreign direct investment directly into the manufacturing sector. Thus, the development has heightened the discussion on the nexus between exchange rate management and manufacturing sector performance.

As part of the efforts to improve the productivity of the manufacturing sector in the economy and remove other inhibiting factors that influence the sector's output, the Structural Adjustment Programme (SAP) was introduced by the authority in Nigeria in 1986. A critical component of SAP was the exchange rate deregulation "intended to make foreign exchange more accessible for production, thereby increasing manufacturing output" (CBN, 2003). Also, a prime objective of the SAP was to restructure the production base of the economy with a view to improving exports (oil and non-oil) via the cumulative depreciation of the effective exchange rate. However, the development resulted to an upward swing in exchange rate movement with attendant fallouts on every sector of the economy in Nigeria. In a bid to revert exchange rate volatility ensued from SAP, the authority has adopted exchange rate deregulation policy regime since 1986.

Based on the aggregate and variant channels such as trade, inflation, investment, unemployment and exports, extant studies have examined the effect of exchange rate management and manufacturing sector performance in Nigeria with conflicting findings (see Adelowokan, 2012; Adeniran, Yusuf, Adeyemi, 2014; Okoronta, & Odoemena, 2016; Nwosu, 2016; Nsofo, Takson, & Ugwuegbe, 2017 and Iyeli, & Utting, 2017). However, the manufacturing sector output which should be studied at disaggregated level have been largely ignored in empirical studies in Nigeria. Thus, scant attention paid to decomposing manufacturing sector performance into oil and non-oil for investigation in Nigeria has motivated this study. Hence, this study fills this gap. Having introduced the study, the sub-subsequent following gives the literature review, section three discusses the methodology, and section four shows the presentation and the analysis of the result while the last section offers the conclusion of the study.

EMPIRICAL REVIEW

Persistent upward swing in the movement of domestic currency against foreign currencies has been a topical issue among policymakers and economists in developing economies, Nigeria inclusive. This bothers on whether the progressive depreciation or devaluation of local currencies has been aiding the developing economies to achieve improved manufacturing sector output, balance of trade and sustainable economic growth. However, while some studies concentrated on the relationship between the exchange rate movement or volatility and entire economic growth, others have narrowed down the discussion to the nexus between exchange rate volatility and manufacturing sector performance with the prime aim of investigating the causality or effect (even both) of one variable on the other. In this regard, the common approach adopted by most of the study on this subject was to study manufacturing sector performance in aggregation without serious attention being given to disaggregating the sector, while the entire sector may not be affected with the same magnitude. For instance, Ehinomen, & Oladipo (2012) investigated the impact of exchange rate management on the growth of the manufacturing sector in Nigeria from 1986-2010. The study used ordinary least squares (OLS) technique of estimation and the findings revealed that exchange rate appreciation was a key to promoting manufacturing sector output in Nigeria. Using Nigerian dataset of annual basis and OLS method, King-George (2013) explored the effect of exchange rate volatility on the Nigerian manufacturing sector from 1986-2010. Contrary to Ehinomen, & Oladipo (2012)'s findings, the outcomes showed that exchange rate was not a determinant factor in the growth of manufacturing sector output in Nigeria.

Furthermore, as a clear demonstration of serious interest by the economists to exhume the relationship between exchange rates movement and manufacturing sector performance in developing areas, and to assist the policy makers to formulate informed policies, more empirical studies have ensued. Abdul-Mumuni (2016) examined the effect of exchange rate fluctuations on manufacturing sector output in Ghana from 1986-2013. The study employed autoregressive distributed lag (ARDL) technique of estimation. Findings revealed that, both in the short-run and long-run, there was positive association between an exchange rates movement and manufacturing sector output in Ghana. Again, Lawal (2016) studied the effect of exchange rate instabilities on the manufacturing sector productivity in Nigeria from 1986-2014. The study implemented ARDL technique and the outcomes showed that exchange rate variability had positive effect, though not statistically significant, on manufacturing sector both in long-run and short-run. Okafor, Adegbite, & Abiola (2018) investigated exchange rate variations, inflation and industrial output in Nigeria from 1981:q1-2015:q4 and structural vector autoregressive method was used. The study obtained that positive shocks from exchange rates negatively influenced output growth, likewise positive shocks from inflation. Similarly, Oseni, Adekunle & Alabi, (2019) investigated the association between exchange rate volatility and industrial output growth in Nigeria from 1986-2017. Using AR(k)-EGARCH(p,q) method to determine the volatility in the exchange rates and ARDL approach to study short-run and long-run dynamics of industrial performance in Nigeria. The results showed that exchange rate volatility was a key determinant of industrial output in Nigeria.

Basically there are some other studies which explored exchange rate and other macroeconomic variables, among them are: Azu, & Nasiri (2015) analysed the exchange rate variabilities and sustainable economic growth in Nigeria from 2004-2014. The study employed vector autoregression (VAR) technique. The study discovered that real exchange rates variabilities

were positively connected to import but negatively related to FDI and real GDP in Nigeria. Solely (2013) studied the impact of macroeconomic factors on manufacturing sector in Nigeria from 1975-2011. Using error correction model discovered that loans, advances and FDI flowing into the manufacturing sector enhanced the level of productivity of the sector. Ilechukwu, & Nwokoye (2015) assessed the effect of exchange rate steadiness on industry in Nigeria from 1980-2013, using OLS procedure. The study found that real exchange rates, foreign direct investment and population growth rate enhanced growth in industrial output in Nigeria in the reference period.

Ismaila (2016) examined an exchange rate decline and GDP in Nigeria before- and post-Structural Adjustment Programme era. The study employed ECM technique of estimation and obtained that net export, broad money and public expenditure significantly influence real output in the long-run, while exchange rates no significant effect on GDP in Nigeria in both short-run and long-run respectively. The implications are that exchange rate depreciation during the SAP period has no significant impact on Nigeria's financial performance. In the same vein, Nsofo, Takson, & Ugwuegbe (2017) investigated the effect of exchange rate variations on Nigeria GDP from 1981 to 2015 with generalized autoregressive conditional heteroscedasticity and generalized method of moments. The study discovered that persistent variations in exchange rate and foreign direct investment had negative influence Nigerian GDP during the period reviewed. Using Johansen Co-integration test and Normalized Co-integration, Kenny (2019) examined the manufacturing sector output, exchange rate instabilities and inclusive growth in Nigeria from 1981-2015. Findings obtained showed that there was long run association between the variables of interest and that manufacturing sector output exerted long-run impact on per capita income in the economy.

METHODOLOGY

Analytical Model

The model specification of this study follows Mumuni (2016) with modifications by removing gross fixed capital formation and manufacturing capital utilization rate from the original model. Thus, the Auto Regressive Distributed Lag (ARDL) model is adopted, using Nigerian dataset from 1986-2019. The ARDL (p, q) model is stated as;

$$Y_t = \gamma_0 + \gamma_{1t} + \sum_{i=1}^p \phi_1 Y_{t-i} + \sum_{i=0}^q \beta' X_{t-i} + \varepsilon_t \quad (1)$$

Where Y_t represents manufacturing sector output and X stands for real exchange rates. In the context of relationship among exchange rate, interest rate and inflation, the interest rate differentials provides that the variables may move together. The monetary authority in the economy, by manipulating interest rate, exercises influence on both exchange rate and inflation, i.e. changing interest rate affects inflation and currency values. This scenario implies that a higher interest rate offers creditors in an economy a higher returns relative to other economies. Thus, a higher interest rate attracts foreign investment and causes the rate of exchange to rise. However, the effect of higher interest rate is eased out if inflation rate in the domestic economy is much higher relative to other countries and the reverse holds for decreasing interest rate where a lower interest rate tends to decrease exchange rate. Therefore, this theoretical background has provided room for taking real interest rate and inflation rate as control variables the analysis of exchange rate and manufacturing sector output (Ebiringa & Anyaogu,

2014; Monfared & Akin 2017). Decomposing the equ. (1) to bear the variables of interest, the model is stated thus;

$$\Delta \ln MAN_t = \phi_0 + \beta_1 \ln MAN_{t-1} + \delta_2 REXCH_{t-1} + \lambda_3 RINT_{t-1} + \pi_4 INF_{t-1} + \sum_{i=1}^p \Gamma_i \Delta \ln MAN_{t-i} + \sum_{i=0}^n \psi_i \Delta REXCH_{t-i} + \sum_{i=0}^m \gamma_i \Delta RINT_{t-i} + \sum_{i=0}^y \Psi_i \Delta INF_{t-i} + \varepsilon_t \quad (2)$$

where β_1 , δ_2 , λ_3 and π_4 are long-run coefficients, Γ_i , ψ_i , β_i and Ψ_i provide short-run dynamic coefficients and Δ is the first difference. p , n , m and y are extreme lag orders determined by lag order selection criteria. From Equ. (2), long-run interaction is verified using ARDL Bounds testing co-integration offered by Pesaran, Shin & Smith (2001) which gives its null hypothesis as follow; $H_0: \beta_1 = \delta_2 = \lambda_3 = \pi_4 = 0$, suggesting no co-integrating equation against the alternative $H_1: \beta_1 \neq \delta_2 \neq \lambda_3 \neq \pi_4 \neq 0$, indicating evidence of a co-integrating relationship. If long-run relationship occurs among the variables, then error correction model is stated as follow;

$$\Delta \ln MAN_t = \phi_0 + \sum_{i=1}^p \Gamma_i \Delta \ln MAN_{t-i} + \sum_{i=0}^n \psi_i \Delta REXCH_{t-i} + \sum_{i=0}^m \gamma_i \Delta RINT_{t-i} + \sum_{i=0}^y \Psi_i \Delta INF_{t-i} + \lambda_i ECM_{(-1)} + \varepsilon_t \quad (3)$$

If otherwise, only short-run model must be estimated and equation (4) is stated as follows;

$$\Delta \ln MAN_t = \phi_0 + \sum_{i=1}^p \Gamma_i \Delta \ln MAN_{t-i} + \sum_{i=0}^n \psi_i \Delta REXCH_{t-i} + \sum_{i=0}^m \gamma_i \Delta RINT_{t-i} + \sum_{i=0}^y \Psi_i \Delta INF_{t-i} + \varepsilon_t \quad (4)$$

Method of Estimation

Auto Regressive Distributed Lag-Error Correction Method (ARDL-ECM) was used to examine the effect of exchange rate management on manufacturing sector in Nigeria from 1986-2019. Co-integration relationship among variables of interest was examined using ARDL Bounds Testing procedure. ARDL Bound Testing co-integration approach, being a dynamic condition relates lag of dependent variable with the contemporaneous and lagged values of regressors through which the short-run impact could be estimated and the long-run influence could be indirectly assessed (Ukoro & Uko, 2016). This technique has some benefits compared to other co-integration test methods as it allows the equilibrium link to be examined via Ordinary Least Square and it has the capability to pool variables with $I(0)$ and $I(1)$ together and test for co-integration. Similarly, ARDL-ECM method delivers effective results when small size of observations are considered for analysis (Chandio, Jiang & Rehman, 2019).

Data Description and Source

Annual data used for this study included manufacturing sector contribution to GDP. However, this was disaggregated into oil and non-oil series. For oil series, the data was provided separately in the Central Bank of Nigeria Data & Statistics, (2020) and the series were subtracted from entire manufacturing sector contribution to GDP, while the rest was taken as non-oil manufacturing sector contribution. Other variables were real exchange rate (REXH), real interest rate (RINT) and inflation (INF) which were obtained from World Development

Indicators, (2020). The entire data spanned the period of thirty-five years (35), from 1986-2019. The instinct behind choosing 1986 as the beginning year was to include the implementation of SAP policy in Nigeria. Every other data was in rate form (percentage) except manufacturing contribution (oil and non-oil) and was transformed into logarithm.

Unit Root Test

To ensure that the results were not spurious, properties of the series which included stationarity and orders of integration were examined, using unit root test. The test is also performed to justify the use of ARDL method employed in the analysis because no series with $I(2)$ is allowed in the model (Akinlo & Oyeleke, 2018). Unit root test was carried out using Augmented-Dicky-Fuller (ADF) and Phili-Perron (PP) tests. Table 2 provides the outcomes of unit root tests. The findings revealed that real interest and inflation rate series were $I(0)$ series, but real exchange rate, log of nonoil and log of oil manufacturing contribution to GDP were $I(1)$ series i.e. stationary at first difference at 1% significance level. Therefore, it was concluded that the orders of the variables were mixed, hence the use of ARDL.

Table 1. Unit Root Test Results

Variables	ADF		PP		Decision
	Level	First Diff.	Level	First Diff.	
$REXH_t$	-2.029	-4.126***	-1.935	-3.983***	$I(1)$
$RINT_t$	-5.577***		-5.575***		$I(0)$
INF_t	-2.885*		-2.756*	-12.926***	$I(0)$
$LNOIM_t$	-0.542	-4.609***	-0.353	-4.630***	$I(1)$
$LOIM_t$	-1.255	-6.593***	-1.312	-6.597***	$I(1)$

***/**/* indicate 1%, 5% and 10% level of significance respectively.

Co-integration Test

Table 2 provided the outcomes of unit root tests which revealed that the series were mixed of $I(0)$ and $I(1)$, indicating that ARDL Bounds Testing procedure of co-integration was appropriate. The method offered by Pesaran, Shin & Smith, (2001) provides for co-integration possibility of series with integration of varied orders. However, as decision guidelines, if the calculated F -statistic is larger than the upper bound critical values, null hypothesis of no equilibrium is rejected regardless of the integration orders of the series. Contrarily, if the calculated F -statistic is lesser than lower bound statistics, the null hypothesis is not rejected. Finally, if the calculated F -statistic drops between the lower and upper bound critical values, then the result is faltering (Akinlo & Oyeleke, 2018). The findings of co-integration test were provided in Table 2 panel A & panel B respectively. Panel B showed the co-integration test results of oil manufacturing contribution to GDP (OILM) model, while panel A presented co-integration test outcomes of nonoil manufacturing contribution to GDP (NOIL) model. Panel B revealed there was an equilibrium among the variables since the calculated F -statistic was larger than the critical F -statistics at 5% level of significance. Thus, it was concluded that the null hypothesis of no co-integration among the variables was rejected in the model. However, there was no co-integration among the variables in panel A because the calculated F -statistic was smaller than the critical values at lower bound.

Table 2 Panel A. ADRL Bounds Testing Co-integration Results for (NOIL) Model 1

<i>Computed F-statistic</i> = 1.913		K	Observation
Asymptotic Critical Values		3	35
Lower Bounds: I(0)		Upper Bounds: I(1)	
10%	2.72	3.77	
5%	3.23	4.35	
2.5%	3.69	4.89	
1%	4.29	5.61	

Table 2 Panel B. ADRL Bounds Testing Co-integration Results for (OILM) Model 2

<i>Computed F-statistic</i> = 4.654**		K	Observation
Asymptotic Critical Values		3	35
Lower Bounds: I(0)		Upper Bounds: I(1)	
10%	2.72	3.77	
5%	3.23	4.35	
2.5%	3.69	4.89	
1%	4.29	5.61	

**** indicate statistically significance at the 5% level.**

Lag Length Order

Having found long-run linkage among the series of OILM model but no co-integration connection was found among series of NOIL model, it became necessary to determine the lag length appropriate to be included in each of the models. However, lag 2 was chosen for the two models based on Pesaran, Shin and Smith, (2001)'s idea that lag 2 is adequate when using annual time series especially if small number of observations are involved, as in this case.

DISCUSSION OF RESULTS

ARDL short-run estimated results of Model 1 involving NOILM; REXH; RINT; INF and Model 2 comprising OILM; REXH; RINT; INF respectively were presented in Table 3. Due to the co-integration connection found among the variables in Model 2, error correction model (ECM) of equation (3) was estimated. ECM brings together the short-run association in I(1) and the long-run information provided by the series in I(0). "The information provided by the likelihood ratio test is used to generate a set of the models that capture the short- and long-run behavior of the manufacturing output in Nigeria" (Akinlo & Oyeleke, 2018). Coefficient of ECM is the adjustment speed back to long-run association among variables when there is distortion in the short-run. However, since co-integrating association was not found in Model 1, only short-run model i.e. equation (4) was estimated without corresponding long-run information provided by the series. Short-run dynamic results with the ECM were presented for Model 2 while short-run estimated results without ECM were presented for Model 1 as shown in Table 3.

In Model 1, the short-run coefficient of real exchange rates (-0.0003) in the current year was found to be negative and statistically significant at 5% level, given its t-statistic and p-values (-2.415; 0.022). This showed that 1% increase in real exchange rates influenced non-oil manufacturing sector in Nigerian economy to decline by 0.0003%. The results implied that the surge in real exchange rates crippled the activities of non-oil manufacturing sector in Nigeria. The findings agreed with Opaluwa, Umeh, & Abu, 2010; Godwin, & Idaraobong; 2019; Faleye et al 2019; Ayobami, 2019 but contradicted the results of Ismaila, 2016; Iyeli, & Utting,

2017 among others. Again, the short-run coefficient of inflation rates (0.002) was positive and statistically significant at 5% level due to its t-statistic and p-values (2.636; 0.013). This showed that inflation was an important driver of non-oil manufacturing sector in Nigeria in the reference period. This result was consistent with the theories that a mild inflation might be necessary for the economic activities to move forward. However, the outcomes did not agree with findings of Judith & Chijindu, (2016) for Nigeria.

Table 3. ARDL Short-run Coefficient Estimation

	Model 1			Model 2		
Regressors	Coeff.	t-statc	Prob.	Coeff.	t-static	Prob.
C				0.097 (0.009)	1.100	0.324
D(REXH)	-0.0003 (0.000)	-2.415	0.022**			
D(REXH(-2))				-0.005 (0.001)	-3.994	0.001***
D(RINT)	0.002 (0.000)	1.438	0.160	-0.015 (0.004)	-4.011	0.001***
D(RINT(-1))				-0.011 (0.004)	-2.830	0.009***
D(INF)	0.002 (0.003)	2.636	0.013**	-0.012 (0.005)	-2.249	0.348
ECM(-1)				-0.853 (0.004)	-2.573	0.017**

Note: Standard Error in (). *&** indicating statistical significance level at 1% and 5% respectively based on Mackinnon critical values.**

In Model 2, the short-run coefficient of real exchange rates (-0.005) in the last two years was negative and significant at 1% level, given its t-statistic and p-values (-3.994; 0.001). The results revealed that 1% rise in real exchange rates in Nigeria impacted oil manufacturing sector in economy to decline by 0.005%. The outcomes suggest that growth in real exchange rates hindered the activities of oil manufacturing sector output in the period under consideration. This has been the major finding of this study. However, the short-run estimated coefficients of real interest rates, both in the current and previous years, were negative and significant at 1% level. This might not be unconnected with the fact foreign firms dominate the operation in oil manufacturing sector and their activities require large capital, both loans and machineries. This result was contrary to the results obtained for non-oil manufacturing sector where the effect of real exchange rates were positive and not significant, indicating that a rise in interest rates has different effects on non-oil and oil manufacturing sector performance in the economy of Nigeria. Also, an increase in inflation rates impacted the industries in the sector differently. The coefficient of ECM (-0.853) which indicated the adjustment speed back to the long-run relationship among the variables in Model 2 was negative and significant at 5% level, given its t-statistic (-2.573) and p-value (0.017). Thus, the ECM could successfully correct the deviations happened in the association within the period of eight and half years.

ARDL Long-run Estimation Results

ARDL long-run estimated results were provided in Table 4. In the long-run Model 1, the results showed that the coefficient of real exchange rates (-0.0004) was negative and statistically significant at 5% level. This findings corroborated the outcomes of Okafor, Adegbite, & Abiola (2018) as well as the results obtained in the short-run estimation, but was not consistent with Judith & Chijindu, (2016) and Abdul-Mumuni (2016)'s findings which gotten positive effect of exchange rates on manufacturing output in Nigeria and Ghana respectively. In another development, in the long-run, the estimated coefficient of real interest rates (0.002) was positive with t-statistic (1.438) and p-value (0.160), though not statistically significant. This

obviously revealed that real interest rates was not a key driver of non-oil manufacturing sector performance in Nigeria during the reference period. Furthermore, the coefficient of inflation rates in the current year was positive and statistically significant at 5% level. The long-run coefficient results confirmed the short-run results in Table 3.

Table 4. ARDL Long-run Coefficient Estimation

	Model 1 (1, 0, 0, 0)			Model 2 (2, 0, 1, 0)		
Regressors	Coeff.	t-statc	Prob.	Coeff.	t-static	Prob.
C	0.234 (0.091)	2.568	0.015	0.097 (0.009)	1.100	0.324
NOIL(-1)	-0.989 (0.011)	94.173	0.000***			
OILM(-1)				0.610 (0.1170)	3.599	0.001***
OILM(-2)				0.353 (0.170)	2.139	0.041*
REXH	-0.0004 (0.000)	-2.415	0.022**	-0.002 (0.001)	-2.442	0.029**
RINT	0.002 (0.001)	1.438	0.160	-0.009 (0.005)	-1.946	0.061
RINT(-1)				-0.009 (0.005)	-1.796	0.083
INF	0.003 (0.001)	2.636	0.013**	-0.001 (0.005)	-0.120	0.905

R-squared	0.998	0.985
Adjusted R-squared	0.997	0.982
Prob(F-statistic)	0.000	0.000
Durbin-Watson	2.150	2.052
F-statistic	3705.916	323.224

Note: Standard Error in (). *&** indicating statistical significance level at 1% and 5% respectively based on Mackinnon critical values.**

In the long-run Model 2, as observed in the short-run Model 1, the long-run coefficient of real exchange rate (-0.002) was equally negative and significant at 5% level. This development indicated that real exchange rate was a key driver of manufacturing sector performance in both short and long-run periods, irrespective of oil and nonoil sector' activities. Real exchange rate has constituted a clog on the wheel of the progress of manufacturing sector in Nigeria, and thus requires authorities' serious attention. Similarly, real interest rate was another hindrance to manufacturing sector output growth, but its effect was not severe during the reference period. *R*-square statistics (0.998; 0.985) indicated that the models were well fitted. These showed that about 99% and 98% deviations happened in non-oil and oil manufacturing sector performance were brought about by the shocks to real exchange rates, real interest rates and inflation in Nigeria from 1981-2019. *F*-statistic values (3705.916; 323.224) revealed the significance of models at 1% level, likewise Durbin-Watson value (2.150; 2.052) signaled that the models were multicollinearity free.

CONCLUSION

This study explored the effect of exchange rate management on disaggregated manufacturing sector output, using Nigerian dataset from 1986-2019. Having disaggregated manufacturing sector performance into oil and non-oil activities, this paper employed Auto Regressive

Distributed Lag (ARDL) Bound testing co-integration technique to determine long-run relationship among the variables in the models. In the non-oil model, the study did not find evidence of long-run association among real exchange rate, real interest rate, inflation and non-oil manufacturing sector performance variable, but the same technique produced evidence of co-integration among oil sector variables. The findings obtained from the autoregressive distributed lag model estimated revealed that, in the short-run, real exchange rates shocks produced negative and significant impacts on both oil and non-oil manufacturing sector activities, real interest rates variations created negative and large effect on only oil manufacturing sector, but inflation shocks produced positive effect on the non-oil sector output only. On the other hand, in the long-run, it was found that only real exchange rate exerted negative and significant effect on both non-oil and oil manufacturing sector outputs, while inflation was found to be a key driver of the non-oil manufacturing sector in Nigeria. Authority in Nigeria should reduce the disparities between foreign and domestic currencies to improve on manufacturing sector performance.

References

- Abdul-mumuni, A. (2016). Exchange rate variability and manufacturing sector performance in Ghana: Evidence from cointegration analysis. *International Economics and Business*, 2(1), 2377-2301.
- Adelowokan, O. A. (2012). Exchange rate pass-through in Nigeria: Dynamic evidence. *European Journal of Humanities and Social Sciences*, 16(1), 784-801.
- Adeniran, J. O., Yusuf, S. A., & Adeyemi, O. A. (2014). The impact of exchange rate fluctuation on the Nigerian economic growth: An empirical investigation. *International Journal of Academic Research in Business and Social Sciences*, 4(8), 224-233. <https://doi.org/10.6007/ijarbss/v4-i8/1091>
- Akinlo, E. A. & Adejumo, V. A. (2014). Exchange rate volatility and non-oil exports in Nigeria: 1986-2008. 9(2): 70 – 79.
- Akinlo, T & Oyeleke, O. J. (2018). Effects of government expenditure on private investment in Nigerian economy (1980-2016). *Emerging Economy Studies*, 4(2), 1-10
- Anyanwu, F. A., Ananwude, A. C., & Okoye, N. T. (2017). Exchange rate policy and Nigeria's economic growth : A granger causality impact assessment. *International Journal of Applied Economics, Finance and Accounting*, 1(1), 1–13.
- Asher O. J. (2012). The impact of exchange rate fluctuation on the Nigeria economic growth (1980 – 2010). Unpublished B.sc Thesis of Caritas University Emene, Enugu State, Nigeria.
- Ayobami, O. T. (2019). Exchange rate volatility and the performance of manufacturing sector in Nigeria (1981 – 2016). *African Journal of Economic Review*, VII(2), 27-41
- Azu, N., & Nasiri, A. (2015). Exchange rate fluctuation and sustainable economic growth in Nigeria: VAR approach. *Journal of Economics and Sustainable Development*, 6(13), 228- 236.
- Bordo, M. D., & Schwartz, A. J. (Eds.). (2009). *A retrospective on the classical gold standard, 1821-1931*. University of Chicago Press.
- Central Bank of Nigeria Statistical Bulletin, (2003)
- Central Bank of Nigeria Data & Statistics, (2020).
- Chandio, A. A., Jiang, Y. & Rehman, A. (2019). Using the ARDL-ECM approach to investigate the nexus between support price and wheat production an empirical evidence from Pakistan. *Journal of Asian Business and Economic Studies*, 26(1), 139-152. DOI 10.1108/JABES-10-2018-0084
- Judith, M. N. & Chijindu, E. H. (2016). Dynamics of inflation and manufacturing sector performance in Nigeria: analysis of effect and causality. *International Journal of Economics and Financial Issues*, 2016, 6(4), 1400-1406.

- Ebiringa, O. T. & Anyaogu, N. B. (2014). Exchange rate, inflation and interest rates relationships: an autoregressive distributed lag analysis. *Journal of Economics and Development Studies*, 2(2), 263-279
- Ehinomen, C., & Oladipo, T. (2012). Exchange rate management and the manufacturing sector performance in the Nigerian economy. *Journal of Humanities and Social Science (JHSS)*, 5(5), 1-12
- Enekwe, C. I., Ordu, M. M., & Nwoha, C. (2013). Effect of exchange rate fluctuations on manufacturing sector in Nigeria. *European Journal of Business and Management*, 5(22), 67 - 73
- Fakiyesi, O. A. (2005). *Issues in Money, Finance and economic Management*. Lagos: University Press.
- Godwin, E. B., & Idaraobong, G. B. (2019). The effect exchange rate deregulation on the manufacturing in Nigeria: An Autoregressive Distributed Lag (ARDL) approach, *International Journal of Economics, Commerce and Management*, VII(12), 813-831
- Hashim, I. A. & Zarma, A. B. (1996). The impact of parallel market on the stability of exchange rate: Evidence from Nigeria, *NDIC Quarterly*, (7)2.
- Ilechukwu, I. N., & Nwokoye, E. S. (2015). Long run impact of exchange rate on Nigeria's industrial output. *Journal of Economics and Finance*, 6(5), 75-86. <https://doi.org/10.9790/5933-06527586>
- Ismaila, M. (2016). Exchange rate depreciation and Nigeria economic performance after structural adjustment programmes (Saps). *NG-Journal of Social Development*, 5(2), 122-132. <https://doi.org/10.12816/0031175>
- Iyeli, I. I., & Utting, C. (2017). Exchange rate volatility and economic growth in Nigeria. *International Journal of Economics, Commerce and Management* (7), 583 – 595
- Kenny, S. V. (2019). Manufacturing sector performance, exchange rate volatility and inclusive growth in Nigeria (1981-2015). *MPRA Munich Personal RePEc Archive*. Retrieved from <https://mpra.ub.uni-muenchen.de/93296/> accessed on 11 January 2020
- King-George, O. (2013). The effect of exchange rate fluctuation on the Nigeria manufacturing sector (1986-2010), 20, 28-29.
- Lawal, E. O. (2016). Effect of Exchange Rate Fluctuations on Manufacturing Sector Output in Nigeria. *Quest Journal of Research in Business and Management*, 4(10), 32 – 39
- Nsofo, E. S., Takson, S. M., & Ugwuegbu, S. U. (2017). Modeling exchange rate volatility and economic growth in Nigeria. *Noble International Journal of Economics and Financial Research*, 2(6), 88- 97.
- Monfared, S. S. & Akin, F. (2017). The relationship between exchange rates and inflation: the case of Iran. *European Journal of Sustainable Development*, 6(4), 329-340.
- Doi: 10.14207/ejsd.2017.v6n4p329
- Nwosu, N. C. F. (2016). Impact of exchange rate volatility on economic growth in Nigeria, 1987- 2014. Unpublished Ph.D Thesis, Department of Banking and Finance, University of Nigeria, Enugu.
- Odili, O. (2014), Exchange rate and balance of payment: An Autoregressive Distributed Lag (ARDL) econometric investigation on Nigeria, *IOSR Journal of Economics and Finance*, 4(6), 21-30.
- Okafor, T., Adegbite, E., & Abiola, B. (2018). Exchange rate fluctuations, inflation and industrial output growth in Nigeria. *International Journal of Supply Chain Management*, 7(5), 118-128. <https://www.scopus.com/inward/record>.
- Okorontah, C. F., & Odoemena, I. U. (2016). Effects of Exchange Rate Fluctuations on Economic Growth of Nigeria, *International Journal of Innovative Finance and Economics Research* 4(2), 1-7.
- Olufayo, M. B., & Fagite, B. A. (2014). Exchange rate volatility and sectoral export of Nigeria: Case of oil and non-oil sectors. *Journal of Economics and Sustainable Development*, 5, (10), 66-69
- Opaluwa, D, Umeh, J.C. & Ameh, A.A (2012). The effect of exchange rate fluctuations on the Nigerian manufacturing sector. *African Journal of Business Management* 4(14), 2994 – 2998.
- Orji, A. et al. (2018). Another other side of the coin: exchange rate movements and the manufacturing sector in Nigeria. *Journal of Infrastructure Development*, 10(1-2) 63-79.

DOI: 10.1177/0974930618811499

Oseni, I. O., Adekunle, I. A., & Alabi, M. O. (2019). Exchange rate volatility and industrial output growth in Nigeria. *Journal of Economics & Management*, 38(4), 129-156. <https://doi.org/10.22367/jem.2019.38.07>

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001) Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics* 16(3), 289–326; <https://doi.org/10.1002/jae.616>

Pilbeam, K. (2006). *International Finance*. New York: Palgrave Macmillan.

Ukoro, E. & Uko, A. K. (2016). Autoregressive distributed lag (ARDL) cointegration technique: application and interpretation *Journal of Statistical and Econometric Methods*, 5(4), 63-91