Research Article

Received: 7 June 2020 / Accepted: 9 January 2021 / Published: 5 March 2021

Real Exchange Rate and Manufacturing Performance in Nigeria

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DOI: https://doi.org/10.36941/ajis-2021-0058

Abstract

The efficacy of currency devaluation to improve output in Nigeria is under debate, and coupled with an unsatisfactory result in the behaviour of the manufacturing sector performance regenerated interest of this study to investigate the impact of exchange rate on output and employment in the sector. The work uses Structural Vector Autoregression, ECM and Canonical Co-integrating Regression to examine the shock effect, short and long-run elasticities of exchange rate on the manufacturing performance. While employment and output are used as a proxy for manufacturing sector performance. The findings show that changes in the exchange rate are fairly elastic with output and employment both in short and long-run. However, changes in the exchange rate are insignificant with employment in the short run. The variance decomposition form the SVAR shows that forecast error shock of the exchange rate is more prolong on employment than output. Consequently, the result of the estimation of the Impulse Response Function from the Monte Carlos shows that one standard deviation of the exchange shock adversely affect employment. The outcome of the result indicates that the Nigerian exchange rate has not improved output and employment in the manufacturing sector. Several factors may be accounted for this, although, it may be due to cost-push inflationary pressure and unfavourable competitiveness. The study suggests the need to encourage long-term supply-side policies among others to improve the situation.

Keywords: *Exchange Rate, Output, Employment, Short-run, Long-run, Manufacture Sector*

1. Introduction

Development of the manufacturing sector is envisaged as the central dynamic in economic transformation. The manufacturing sector can increase income per capita as recorded by the Asia tigers. However, the performance of manufacturing sector in Africa is relatively low compare to other regions in the world; this makes the involvement of the manufacturing sector to aggregate employment and output reasonably low. The perspective is that this sector has prospect to lessen and offer a lasting remedy to high unemployment rate witness in African economies (Tybout, 2000; Popoola et al., 2019). Since independence in 1960, Nigerian' economy has challenged by various political, social and economic instability coupled with mismanagement of resources. The country depends on the oil sector as the main source of revenue. The contribution of the manufacturing sector to aggregate output has been substantial low over the years (Utomi, 1998; Campbell & Asaleye, 2016; Asaleye Adama & Ogunjobi, 2018). In the 1970s, the increase in oil prices contributed greatly to the foreign exchange market. The discovery of oil during the time made the economy to rely on the oil sector (Popoola, Asaleye & Eluyela, 2018; Olopade, et al., 2019). However, the manufacturing sector before the era of oil has played a significant role in employment generation.

To improve the situation, the Nigerian government has pragmatic different programmes and economic reforms to diversify the revenue base through the exchange rate, monetary and fiscal policies (Obadiaru, et al., 2018; Oladipo et al, 2019[b]). The exchange rate, on the other hand, is an important macroeconomic indicator used in determining the level performance of an economy because the overall movement in exchange rate tends to have multiplier effects on macroeconomics variables (Asaleye, Okodua, Oloni & Ogunjobi, 2017). Developed and developing economies aim to achieve sustainable growth and development by adopting an appropriate exchange rate regime. Price stability plays a dominant factor in this regard due to the influence and stimulus of the exchange rate to determine the degree of economic stability and macroeconomic competitiveness (Fraj, Hamdaoui & Maktouf, 2018; Asaleye, Lawal, Popoola, Alege & Oyetade, 2019). Nigeria practices the floating exchange regime by intending to improve trade balances and bolster output, especially from the manufacturing sector. However, irrespective of the exchange rate regime that a country chooses, there are tendencies for the economy to be exposed to different asymmetric shocks which might result in economic imbalances and need for adjustment in the exchange rate policy over time.

A strand in the literature believes that exposing the manufacturing sector to exchange rate fluctuations will affect output and employment negatively (Obstfeld & Rogoff, 2001; Ederington, Guan & Yang, 2019). The Nigerian foreign exchange market has been affected by various factors some of which include a structural shift in production, changing pattern of international trade and institutional changes in the economy. Besides, Collier and Gunning (1999) pointed out that one of the major factors that has hindered the growth of the manufacturing exports has been overvaluation of the foreign exchange rate in some West African countries. Recently, the potential of the manufacturing sector in the transformation of the Nigerian economy has been emphasised in the literature (Asaleye, Adama & Ogunjobi, 2018; Asaleye, Isoha, Asamu, Popoola & Ogadimma, 2018). However, the effect of exchange rate fluctuation on the manufacturing performance has generated controversial issues and debates in the literature, most especially for developing economies (Chang, 2011; Shaari et al, 2010; Shabahz et al 2011). Notably, the reason is based on different channels in which exchange rate affects the economy. Most of the manufacturing sector in developing economies highly dependent on the import of inputs and capital goods that are usually paid for in foreign exchange. However, the volatility in price as made the exchange rate to be unstable, which is presumed to adversely affect the economy (Jongbo, 2014). Devaluation of the currency also affects monetary policy, which on returns has implications for macroeconomic performance, most especially output and employment. This shows that there exists a cyclical relationship between the exchange rate and manufacturing output and employment (CBN, 2016).

There is no consensus in the literature on the implication of the exchange rate on output and employment. However, evidence from the literature has shown that theoretically, the effects of the

exchange rate can increase or decrease output in the long-run (Mundell, 1961; Mckinnon, 1963). While empirical studies have emphasised that it depends on different factor such as degree of openness exposure and market power, characteristics and nature of the goods (Dhasmana, 2015; Funke & Raif, 2001; Aizenman & Pinto, 2005). Strand of the literature shows the implication on output is positively related (Mao, Yao & Zou, 2019; Hunegnaw, 2017), and negatively related (Aizenman & Pinto, 2005; Viaene & Vries, 1992) while others documented the implication on employment is positive (Dong, Ma & Wei, 2020; Chang, 2001), and negative (Campbell & Lusher, 2019; Dai & Xu, 2017; Demir, 2004). Generally, scholars have documented that the transmission of exchange rate influence the economy through the effect of the shock (Dong, Ma & Wei, 2020; Mao, Yao & Zou, 2019; Campbell & Lusher, 2019; Lee, 2018; Hammermesh, 1993), short and long-run effects (Alam et al., 2017; Shabahz et al., 2011; Hunegnaw, 2017). This study contributed to the existing literature is two-fold. Firstly, by adopting the Structural Vector Regression (SVAR) to examine the influence of exchange rate shock on manufacturing performance indicators in Nigeria, using employment and output in the manufacturing sector as a proxy for performance. Secondly, by using the Error Correction Model (ECM) and Canonical Co-integrating Regression (CCR) to investigate the effect of short and long-run elasticities of exchange rate on manufacturing sector performance.

This study is structure into five sections; Section 2 presents the Literature Review. Section 3 discusses the Empirical Model of the Study. Section 4 explains the Presentation of Result. Finally, Section 5 concludes with policy recommendation as well.

2. Review of Related Studies

Theoretically, studies have shown that the exchange rate affects the economy through many channels. Notably, are through investment, price stability, degree of openness and ability of the self-sufficiency of the monetary institution (Aizenman, 1994; Asaleye et al., 2019b). However, concerning the role of the exchange rate in promoting investment opportunities, scholars shared different perspectives. A strand of literature believes that aggregate investment to promote output and employment will improve when economic uncertainty is limited (Aizenman, 1994; Franke, 1991). Distortion in the economy can be caused through introduction of new fiscal, monetary or exchange rate policies. The exchange rate on the other hands' plays an important factor to ensure protectionist and promote investment through the capital flow. Another strand of the literature shared the view that changes of currency via devaluation or any other means may have an insignificant impact on aggregate investment irrespective of the type of exchange rate regime that country is practising (Funke & Ralf, 2001; Viaene & Vries, 1992). Consequently, the Optimum Currency Area (OCA) theory developed by Mundell (1961) and McKinnon (1963) stated that a non-deregulated exchange rate could promote output in the long-run due to its ability to reduce distortion in the economy. The theory also states that it can reduce output growth by slowing the relative price adjustment. More so, the Monetary Model of Exchange Rate stressed that in the long-run, stable nominal demand for money will have a positive effect on the level of national income.

Consequently, few scholars share the opinion that theory suggests that exchange rate promotes growth and development by stimulating aggregate output, encourage investment, ensure price stability and through the autonomy of the monetary institution (Hunegnaw, 2017). Aizenman and Pinto (2005) emphasize that implication of exchange rate regime on the economy cannot be concluded. The authors argued that factors such as the nature of the production and the irreversibility of production process determine the outcome of the exchange rate on the economy to an extent. Likewise, empirical studies have shown inconclusive outcomes on the implications of the exchange rate on the economy. Dhasmana (2015) stressed that the transmission of exchange rate on the manufacturing sector depends on the industry characteristics, degree of market power among others. Using India data set and Panel-VAR estimation, Dhasmana (2015) reported that the exchange rate has different effects on the manufacturing sector. The study by Ederington, Guan and Yang (2019) in the United State of America reported that exchange rate explained more variation in payroll and employment. Furthermore, Chang

(2011) examined the impact of exchange rate on unemployment in South Korea and Taiwan. The scholars established a long-run relationship in both countries. Shaari et al (2013) also emphasised on the long-run relationship in Malaysia. Although, most of these studies focused on the impact of exchange rate shock on the economy.

Lee (2018), while studying industrial output fluctuations in developing countries, argues that income levels and trade openness are important factors in determining shocks in manufacturing output. While the study by Asalye, Adama and Ogunjobi (2018) explained the connections between manufacturing output and employment but ignored the effect of the exchange rate. Scholars have identified the transmission of shocks as one of the main channels in which the exchange rate affects the economy. Furthermore, Dong, Ma and Wei (2020) show that the effect of exchange shock increase employment in China. Mao, Yao and Zou (2019) investigate the nexus among productivity growth, fixed exchange rate and export-led growth in China. The authors concluded that undervaluation promotes aggregate growth in the economy. Also in China, Dai and Xu (2017) documented that exchange rate shock resulted in the reallocation of employment across the industries. More so, Campbell and Lusher (2019) reported that exchange rate shock affects workers in the manufacturing sector negatively where there is a high degree of exposure to international trade but reduces wage across in all sectors. Furthermore, the study by Demir (2004) shows that exchange rate shock causes employment reduction in Turkey.

Another strand of literature shown the transmission of exchange impacts on the economy is through the short and long-run effects. Few among other include the study by Alam et al (2017) that documented a positive long-run impact of exchange on Pakistan's economy. In a similar study by Shabahz et al. (2011), that used Autoregressive Distributed Lags (ARDL) to investigate the short and long-run effect of exchange rate on the economy. The scholars stressed that the effect of exchange on the output sector is unclear. However, Shabahz et al. (2011) reported that exchange rate fluctuation resulted in the reduction of positive impacts of the monetary policies, with an argument based on the fact effect of depreciation result to long-term unfavourable trade. Hunegnaw (2017) shows that the exchange rate has a short-run and long-run impacts on the manufacturing sector. In the short-run, the scholars stated that the exchange rate devaluation promotes labour intensive on low and middle-skilled workers in the manufacturing sector. However, the author reported a negative effect on high skilled workers. Different studies have advanced in Nigeria to analyse the impact of the exchange rate on the economy. However, most of these studies focused on aggregate output, macroeconomics performance and industrial output (Asaleye et al., 2019c; Oladipo et al 2019a) For example, the study by Areghan, Felicia, Maria, Godwill and Chisom (2018) examine the impact of exchange rate management on output in Nigeria. Likewise, the study by Onakoya (2018), investigated the dynamics of macroeconomic variables and the output in the industrial sector in Nigeria. The study reveals that there exists no short-run relationship between output and exchange rate and unemployment amongst other variables considered.

It has been observed from the official statistics that despite the changes in the exchange rate to reduce importation and encourage promotion of output in the manufacturing sector, the aggregate importation of goods is on the increasing trend in Nigeria (CBN, 2019). Effects of this has caused absolute and relative poverty in Nigeria (Aremu et al., 2020; Aremu et al., 2018; Arisukwu et al., 2019; Ogundipe et al., 2019). Yang (1997) opines that the exchange rate affects product substitutability and relative domestic and foreign shares in the local market. Based on the transmission of exchange rate on output and employment identified in the literature, this study investigates the impact of exchange rate shock on manufacturing performance in Nigeria. The proxy used for manufacturing performance is output and employment in the sector. Likewise, the study normalised on employment and output in the manufacturing sector to establish employment and output equations respectively. The employment and output equations was used to investigate the short and long-run elasticities of the exchange rate on the performance of the manufacturing performance.

3. Empirical Models

3.1 Model Specification

This study follows the general reduced form of labour demand specification by Hammermesh (1993) with slight adjustment; hence, the model for this study is specified as follows:

$$MGDP = f(MEMP, MCAP, INTR, EXCR, MROP) \quad (1)$$

In equation 1, MGDP is output in the manufacturing sector proxy with Nigerian manufacturing output contribution to aggregate output. MEMP is employment in the manufacturing sector, MCAP is capital used in manufacturing sector proxy by the credit to private sector, INTR and EXCR are interest rate and exchange rate respectively. Finally, MROP is trade openness in the manufacturing sector, computed using the ratio of trade flows in the manufacturing sector and output in the sector. Applying log to equation 1, MROP is assumed to be in exponential growth, the explicit function becomes:

$$mgdp_t = \beta_0 + \beta_1 memp_t + \beta_2 mcap_t + \beta_3 \text{int}\, r_t + \beta_4 excr_t + \beta_5 mrop_t + u_t \quad (2)$$

The lower case of the variables in equation (2) shows that there are in log-form, this will enable us to use the concept of elasticity. Likewise, the implicit function in equation (1) is not in linear form. The linear double-log form will help to estimate using least square, which will also help to reduces multiplicative association to additive form for the purpose mathematical simplification. In equation (2), t is the time of observation. The variables used in this work are estimated using annual data for 1981 to 2018. Firstly, the study carries the unit root test to determine the order of integration in the series using Augmented Dickey-Fuller (ADF) and Phillip Perron (PP). Based on the outcome of the result of the stationarity tests, the study uses the Error Correction Model (ECM) to compare the short and long-run elasticities. The fundamental statistical assumption essential for this technique is that the series is stationary stochastic processes, which means 'processes with constant unconditional means and variances'. The ECM equation is given as:

$$\Delta Y_t = \alpha_0 + \tau \Delta X_t + (\alpha_1 - 1)(Y_{t-1} - X_{t-1}) + \varepsilon_t \quad (3)$$

In equation 3, Y is the dependent variable and X is the independent variable. The short and long-run elasticities are expressed as follows:

$$\Delta Y_t = \alpha_0 + \tau_0 \Delta X_t + (\alpha_1 - 1)(Y_{t-1} - \frac{\tau_0 + \tau_1}{1 - \alpha_1} X_{t-1}) \quad (4)$$

$$\tau^*(1) = \frac{\tau_0^* - \tau_1}{1 - \alpha_1} \quad (5)$$

Equations 4 and 5 give the short and run elasticities respectively. X_{t-1} is the long-run parameter as in equation (4) but restricted. The study uses output and employment in the manufacturing sector as the dependent variable.

Furthermore, the long-run elasticity equations for employment and output are established by normalising on employment and output variable. The study employed Canonical Cointegrating Regression (CCR) to show the long-run equation while the ECM was used on the basis to compare the short and long-run elasticities. The preliminary assessment of cointegrating vectors carries out on the series using Johansen Cointegration Test before applying the CCR. The result indicates that the series are cointegrated. The CCR encompasses changing and modifications in the integration of non-stationary series, it is similar to other technique of estimation to investigate long-run behaviour. However, the changes and modifications are done in such a way to ensure that the least-squares method produces asymptotically efficient estimators and chi-square tests. The CCR equation is given as:

$$q_{1t}^* = \partial^1 q_{2t}^* + v_{1t}^* \quad (6)$$

In equation 6, $v_{1t}^* = v_{1t} - \Omega_{12}\Omega_{22}^{-1} v_{2t}$, indicates that the changes and modifications of the variables help

to remove the asymptotic bias that may have been resulted through correlation of the error terms (v_{1t} and v_{2t}). Equation 6 is derived by assuming q_t = (q_{1t}, q_{2t}) to be an m-dimensional of integrating the process of order one. The formulating procedure for q_t is that long-run processes associating with the series to be in its triangular form, given that $q_{1t} = \partial^1 q_{2t} + v_{1t}$ and $\Delta q_{2t} = v_{2t}$. Then $v_t = (v_{1t}^1, v_{2t}^1)$ is considered to be strictly not affected by unit root process defined by having zero mean and finite covariance matrix Σ. The standard measure in this scenario is given by 'v' to be $IIDN(0,\Sigma)$ and Σ block – diagonal.

Finally, in this study, the Structural vector autoregressive (SVAR) approach is used to investigate the exchange rate shock. According to Fernandez-Villaverde, Rubio-Ramirez, and Sargent (2005), the representation of the SVAR is given as:

$$A(L)k_t = w_t \tag{7}$$

In equation 7, L represents the lag operator and k_t is the series. $A(L)$ is explained as $A^0 - \sum_{r=1}^{\infty} A_x L^x$ .The matrix is assumed to be one-sided lag polynomial, which expresses all restrictions (most times are non-linear) imposed on the system of equations obtained from the equilibrium. Following Asaleye, Adama and Ogunjobi (2018), the ordering of the variables in the SVAR with slight changes to achieve the objective of the study is as follows: MGDP, MROP, EXCR, INTR, MCAP and MEMP. The matrix form is express as:

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ c_{21} & 1 & 0 & 0 & 0 & 0 \\ c_{31} & c_{32} & 1 & 0 & 0 & 0 \\ c_{41} & c_{42} & c_{43} & 1 & 0 & 0 \\ c_{51} & c_{52} & c_{53} & c_{54} & 1 & 0 \\ c_{61} & c_{62} & c_{63} & c_{64} & c_{65} & 1 \end{pmatrix} \begin{pmatrix} mgdp_t \\ \text{int}\, r_t \\ mrop_t \\ excr_t \\ mcap_t \\ memp_t \end{pmatrix} = = M_{ij} \begin{pmatrix} mgdp_t \\ \text{int}\, r_t \\ mrop_t \\ excr_t \\ mcap_t \\ memp_t \end{pmatrix} \tag{8}$$

The study uses just identifying restrictions while the estimation of the Impulse Response Function (IRF) from the Monte Carlo and Forecast Error Variance Decomposition (FEVD) analyses are used for interpretation. All series are obtained from Central Bank of Nigeria (CBN) statistical bulletin (various issues) except employment in the manufacturing sector, which is compiled from the National Rolling Plan (1980 – 2003) and Statistical Fact Sheets of the Nigerian National Bureau of Statistics (NBS) (2004 - 2018).

3.2 A prior expectation of Exchange Rate on Output and Employment

Theoretically, effect of devaluation of currency on a country like Nigeria is presumed to have either positive or negative on employment and output. *'Positive expectation'*; devaluation weaker the currency compare with the foreign counterpart, this makes export cheaper in the foreign market, promote long-run export sales and improves the balance of payment. More so, this will result to increase in aggregate output and employment because of the increase in export and a decrease in import. The profit from the exportation is a stimulus to cause an improvement in the labour market. On the other, hand, *'Negative expectation'*, devaluation of currency may cause cost-push inflationary pressure. The demand for import goods may be price elastic in the short run as well. If the country depends on the importation of raw material, devaluation will result in unfavourable competitiveness, which will lower output and employment.

4. Presentation of Empirical Results

Table 1a: Series Stationary Presentation

Series Level Result						
Series	**Augmented Dickey-Fuller (ADF)**			**Phillip Perron (PP)**		
	Constant	**Constant & Trend**	**None**	**Constant**	**Constant & Trend**	**None**
MGDP	0.468995	-2.402403	1.528321	0.614138	-1.817416	1.899638
MEMP	-2.273114	-1.793627	0.321506	-2.314794	-1.661934	0.368831
EXCT	-1.571015	-1.249517	1.936098	-1.582769	-1.318806	1.503417
INTR	-3.546315***	-3.285540*	0.508427	-3.527099***	-3.220415*	0.497997
MROP	-2.190434	-2.665099	-0.915286	-1.492023	-1.217253	-0.836296
MCAP	-2.451155	-0.539186	0.191162	-2.536641	-0.436354	1.857736
Series First Difference Result						
Series	**Augmented Dickey Fuller (ADF)**			**Phillip Perron (PP)**		
MGDP	-5.254500***	-5.718800***	-4.944881***	-5.284897***	-5.743191***	-5.043742***
MEMP	-6.815887***	-7.248830***	-6.910893***	-6.799617***	-8.293147***	-6.893368***
EXCT	-5.308984***	-5.517838***	-4.332249***	-5.307679***	-5.717557***	-4.397498***
INTR	-5.516563***	-5.797589***	-5.513102***	-9.005194***	-9.566599***	-9.014671***
MROP	-7.556220***	-7.714477***	-7.637846***	-7.365232***	-7.457999***	-7.427552***
MCAP	-5.705624***	-6.877703***	-4.044310***	-5.895675	-6.947799***	-4.460135

Note: ***, ** and * implies significance at 1 per cent, 5 per cent and 10 per cent respectively.

Source: Authors' Computation using Eviews 10

Table 1a shows the unit root result-using constant, constant & trend and none for both ADF and PP. The series result at level indicates no stationarity; however, INT is stationary at 1 per cent significance level with the inclusion of a constant term. Similarly, stationary at 10 per cent significance level with the inclusion of trend and constant. On the other hand, all series are stationary at 1 per significance level after the first difference. The summary of the result is presented in Table 1b.

Table 1b: Summary of the Outcome of the Stationary Result

Test	**Augmented Dickey-Fuller (ADF)**			**Phillip Perron (PP)**		
Series	**Level**	**First Diff.**	**I (R)**	**Level**	**First Diff.**	**I (R)**
MGDP	-2.402403	-5.718800***	I (1)	-1.817416	-5.743191***	I (1)
MEMP	-1.793627	-7.248830***	I (1)	-1.661934	-8.293147***	I (1)
EXCT	-1.249517	-5.517838***	I (1)	-1.318806	-5.717557***	I (1)
INTR	-3.285540*	-5.797589***	I (1)	-3.220415*	-9.566599***	I (1)
MROP	-2.665099	-7.714477***	I (1)	-1.217253	-7.457999***	I (1)
MCAP	-0.539186	-6.877703***	I (1)	-0.436354	-6.947799***	I (1)

Note: ***, ** and * implies significance at 1 per cent, 5 per cent and per cent respectively.

Source: Authors' Computation using Eviews 10

Table 1b presents the summary outcome of the unit root tests carried in this work. The paper uses the result of the unit root with the inclusion of constant and trend at a significant level of 5 per cent. This enables us to apply a single equation to compare the short-run and long-run elasticities using the ECM. In addition, to established long-run elasticities for output and employment equations using CCR, since all the variables are integrated of the same order.

Table 2: Presentation of Long and Short-run Elasticities for Output (ECM)

Manufacturing Output Equation Result				
Series	**Long-run Elasticities**			
	Coefficient	**Standard Error**	**t-statistics**	**Probability**
MEMP	-1.486541***	0.248550	-5.980862	0.0000
EXCT	0.241516**	0.098367	2.455253	0.0197
INTR	-0.489936***	0.158151	-3.097905	0.0040
MROP	-0.146419	0.164746	-0.888759	0.3808
MCAP	0.045997	0.041449	1.109720	0.2754
Constant	16.12131***	1.569829	10.26947	0.0000
Series	**Short-run Elasticities**			
D(MEMP)	-0.673669***	0.234545	-2.872236	0.0070
D(EXCT)	0.012625	0.078763	0.160286	0.8737
D(INTR)	-0.180402	0.110227	-1.636644	0.1122
D(MROP)	-0.665973***	0.192162	- 3.465695	0.0015
D(MCAP)	0.157539***	0.017676	8.912726	0.0000
ECT	-0.498956**	0.223999	-2.227496	0.0324
Constant	6.627780***	0.302510	21.90927	0.0000
R-Squared: 0.734761			**F-Statistics:** 31.39546	
Adj. R-Squared: 0.711358		**Durbin Watson Stat. :** 2.362488	**F-statistics Prob.:** 0.000	

Note: ***, ** and * implies significance at 1 per cent, 5 per cent and per cent respectively.

Source: Authors' Computation using Eviews 10

The ECM was employed on the basis to compare the short and long-run behaviour of manufacturing performance as a result of changes in the effect of exchange rate. Table 2 shows the long and short-run elasticities for output (ECM). It is depicted from the outcome of the result that MEMP and INTR are statistically significant at the level of 1 per cent, while EXCT is significant at the level of 5 per cent for the long-run equation. The short equation is statistical significance at the level of 1 per cent for MEMP, MROP and MCAP. The ECT is the error correction term, which captures the speed of adjustment to the equilibrium. The ECT is negative and statistically significant at the level of 5 per cent indicating the system move at the average speed of 50 per cent to the initial equilibrium. Assessing the short and long-run elasticities, the result indicates that output in the manufacturing sector is inelastic to change in employment and interest rate in the long-run. While output in the manufacturing sector is fairly elastic to change in the exchange rate in the long-run. This result is line with the study of Hunegnao (2017), and Mao, Yao and Zou (2019) that reported a positive relationship between exchange rate and output in the literature. However, the finding contradicts the study by Dhasmana (2015), and Viaene and Vries (1992). The short-run behaviour shows that output in the manufacturing sector is inelastic to change in employment and degree of exposure to trade measured by trade openness. While it was fairly elastic to change in credit given to the private sector. The exchange rate is not statistically significant in the short-run. The insignificant of exchange rate on output is line with the study by Funke and Raif (2001), and Aizenman and Pinto (2005) who stressed that exchange rate has an insignificant impact on employment and output.

Table 3: Presentation of Long and Short-run Elasticities for Employment (ECM)

Employment Equation Result				
Series	**Long-run Elasticities**			
	Coefficient	**Standard Error**	**t-statistics**	**Probability**
MGDP	-0.355066***	0.059367	-5.980862	0.0000
EXCT	0.114708**	0.048326	2.373642	0.0238

INTR	-0.055478	0.087576	-0.633486	0.5309
MROP	0.124878	0.078457	1.591684	0.1213
MCAP	-0.000116	0.020643	-0.005642	0.9955
Constant	8.685761***	0.413473	21.00682	0.0000
Series	**Short-run Elasticities**			
D(MGDP)	-0.037889**	0.017622	2.150112	0.0385
D(EXCT)	0.127147**	0.058733	2.164832	0.0385
D(INTR)	-0.128215	0.079769	-1.607328	0.1185
D(MROP)	-0.315508***	0.098767	3.194459	0.0030
D(MCAP)	0.203531**	0.108855	1.869741	0.0713
ECT	-0.568633***	0.170871	-3.327846	0.0023
Constant				
R-Squared: 0.771183			**F-Statistics:** 21.57000	
Adj. R-Squared: 0.735431		**Durbin Watson Stat. :** 1.815479	**F-statistics Prob.:** 0.000	

Note: ***, ** and * implies significance at 1 per cent, 5 per cent and per cent respectively.

Source: Authors' Computation using Eviews 10

Table 3 describes the outcome of the result for long and short-run elasticities for employment (ECM). In the long-run analysis, MGDP and EXCT are statistically significant at the level of 1 per cent and 5 per cent respectively. In the short-run MROP and ECT are statistically significant at the level of 1 per cent while MGDP, EXCT and MCAP are significant at the level of 5 per cent. The ECM shows that the system adjust at the average speed of 57 per cent to equilibrium. Evaluating the short and long-run elasticities, the result indicates that changes in output and exchange are inelastic and elastic respectively to employment in the long run. The outcome of the findings is in line with the study of Dong, Ma and Wei (2020), and Chang (2011) that reported that exchange rate and employment exert a positive relationship in the literature. While the result contradicts the study by Dai and Xu (2017), Campbell and Lusher (2019), and Demir (2004) who documented a negative relationship between exchange rate and employment. In the short run, changes in output and trade openness in the manufacturing sector are inelastic to employment while change in the exchange rate is fairly elastic to employment

Table 4: Summary of Canonical Co-integrating Regression (CCR) Result

Output Long-run Equation Result				
Series	**Coefficient**	**Standard Error**	**t-statistics**	**Probability**
MEMP	-1.718483***	0.339087	-5.067978	0.0000
EXCT	0.347354***	0.129581	2.680581	0.0117
INTR	-0.491612**	0.228884	-2.147867	0.0397
MROP	-0.099172	0.211507	-0.468886	0.6424
MCAP	0.007178	0.052742	0.136104	0.8926
Constant	17.67569***	2.105231	8.396081	0.0000
R-Squared: 0.875057		**Adjusted R-Squared**: 0.854905		
Employment Long-run Equation Result				
MGDP	-0.350054***	0.060526	-5.783573	0.0000
EXCT	0.125626**	0.052054	2.413368	0.0219
INTR	-0.051264	0.098027	-0.522963	0.6047
MROP	0.143134*	0.079657	1.796875	0.0821
MCAP	-0.007698	0.021076	-0.365261	0.7174
Constant	8.665356***	0.429860	20.15854	0.0000
R-Squared: 0.755791		**Adjusted R-Squared:** 0.716403		

Note: ***, ** and * implies significance at 1 per cent, 5 per cent and per cent respectively.

Source: Authors' Computation using Eviews 10

Table 4 presents the Canonical Co-integrating Regression (CCR) result for output and employment. The outcome of the results is similar to the ECM long-run result. The long-run output equation shows that MEMP and EXCT are significant at a level of 1 per cent, INTR is significant the level of 5 per cent. The long-run employment equation shows that EXCT and MROP are statistically significant at the levels of 1 per cent, 5 per cent and 10 per cent respectively. For the output equation, change in the exchange rate is elastic while changes in employment and interest rate are inelastic. For employment equation, changes in output and interest are inelastic, while changes in trade openness and employment are fairly elastic. The output equation result is in line with the study of Mundell (1961) and Mckinnon (1963) who stressed that exchange rate promotes output in the long-run.

The general conclusion of the result for both ECM and CCR is that the exchange rate has not improved output and employment both in short and long-run. Several factors may be accounted for the outcome of the result, although maybe due to cost-push inflationary pressure and high demand for import goods due to price elastic of local industry in the short run. More so, another contributing factor maybe because of the high importation of raw material that makes the market unfavourable for competition with the foreign counterpart.

Table 5: Presentation of Variance Decomposition of Exchange Rate

Horizon	Std.	MGDP	INTR	MROP	EXCR	MCAP	MEMP
1	0.101861	0.408546	18.99328	2.121580	78.47660	0.000000	0.000000
2	0.126063	9.581747	17.33929	1.430321	70.30865	0.204708	1.135282
3	0.173310	14.23032	9.199873	0.899658	47.29785	2.471181	25.90111
4	0.217124	14.25867	6.074159	0.615085	34.81735	6.973880	37.26086
5	0.239499	14.59554	5.456776	0.505963	30.48882	10.39283	38.56007
6	0.251898	14.48982	6.702819	0.500891	28.32274	12.31712	37.66661
7	0.262033	14.08619	8.776840	0.568138	26.61027	13.31194	36.64662
8	0.272278	13.55916	10.92609	0.635222	25.01378	13.81270	36.05306
9	0.282510	13.01238	12.78201	0.674492	23.60249	14.05961	35.86902
10	0.292010	12.49894	14.36261	0.688606	22.45047	14.15184	35.84753

Source: Authors' Computation using Eviews 10

Table 5 presents the variance decomposition of the exchange rate along the 10-period horizon. In the first period, the exchange rate forecast error shock of about 0.408546, 18.99328 and 2.121580 per cent show variation each in output in the manufacturing sector, interest rate and trade openness in manufacturing sector respectively. The exchange rate forecast error depicts a variation of about 9.581747, 17.33929, 1.430321, 0.204708 and 1.135282 per cent each in the manufacturing sector, interest rate, trade openness in the manufacturing sector, credit to the private sector and employment respectively. In period three, the exchange rate forecast error shows the variation of about 14.23032, 9.199873, 0.899658, 2.471181 and 25.90111 per cent each in the manufacturing sector, interest rate, trade openness in the manufacturing sector, credit to the private sector and employment respectively. In the fourth period, the forecast error shock exchange rate about 14.25867, 6.074159, 0.615085, 6.973880 and 37.26086 per cent variation each in the manufacturing sector, interest rate, trade openness in the manufacturing sector, credit to the private sector and employment respectively. Period Five shows that the exchange forecast error shock has a variation of about 14.59554 per cent, 5.456776 per cent, 0.505963 per cent, 10.39283 per cent and 38.56007 per cent in the manufacturing sector, interest rate, trade openness in the manufacturing sector, credit to the private sector and employment respectively.

In the sixth period, the exchange rate forecast error shock of about 14.48982, 6.702819, 0.500891, 12.31712 and 37.66661 show in openness in the manufacturing sector, credit to the private sector and employment respectively. The exchange rate forecast error depicts a variation of about 14.08619, 8.776840, 0.568138, 13.31194 and 36.64662 per cent each in the manufacturing sector, interest rate, trade

openness in the manufacturing sector, credit to the private sector and employment respectively in the seventh period. In period eighth, the exchange rate forecast error shows the variation of about, 13.55916, 10.92609, 0.635222, 13.81270 and 36.05306 per cent each in the manufacturing sector, interest rate, trade openness in the manufacturing sector, credit to the private sector and employment respectively. In the ninth period, the exchange rate forecast error shock shows about 0.282510, 13.01238, 12.78201, 0.674492, 14.05961 and 35.86902 per cent variation each in the manufacturing sector, interest rate, trade openness in the manufacturing sector, credit to the private sector and employment respectively. Period ten shows that the exchange forecast error shock has a variation of about 12.49894, 14.36261, 0.688606, 14.15184 and 35.84753 per cent in the manufacturing sector, interest rate, trade openness in the manufacturing sector, credit to the private sector and employment respectively.

The variance decomposition form the SVAR shows that forecast error shock of exchange rate affects output more than employment in the first and second horizons, afterwards the effect is more prolong on employment. The result of the estimation of the Impulse Response Function (IRF) from the Monte Carlos shows that one standard deviation of the exchange shock adversely affects employment for a long period of the horizon (see Figure 1 in appendix).

5. Conclusion

This work investigates the effect of Nigerian exchange rate on output and employment in the manufacturing sector. The contribution of the manufacturing sector to aggregate output has been substantial low over the years. The discovery of oil in the 1970s made the economy to rely on the oil sector. However, the manufacturing sector before the era of oil has played a significant role in employment generation. At various time, the Nigerian government has introduced different programmes and economic reforms to diversify the revenue base using the exchange rate, monetary and fiscal policies. The exchange rate, on the other hand, is an important macroeconomic indicator used in determining the level performance of an economy because the overall movement in the exchange rate tends to have multiplier effects on macroeconomics variables. Strand of literature has documented that the exposure of the manufacturing sector to exchange rate fluctuations affects output and employment. Generally, it was documented in the literature that the transmission of exchange rate influences the economy through the effects of the shock, short and long-run effects. Given this, the study examines the influence of exchange rate shock, short and long-run elasticities on manufacturing performance indicators in Nigeria, using Error Correction Model (ECM), cointegration and Structural Autoregression (SVAR).

The ECM was used to compare the short and long-run elasticities. The Canonical Co-integrating Regression (CCR) was used to established employment and output long-run elasticities equations while the SVAR was employed to investigate the shock effect of exchange on output and employment. When Output is used as the dependent variable, the ECM indicates that output in the manufacturing sector is inelastic to changes in employment and interest rate in the long-run, while is fairly elastic to change in the exchange rate in the long-run. The short-run behaviour shows that output is inelastic to changes in employment and trade openness, while it was fairly elastic to change to credit given to the private sector. The exchange rate is not statistically significant in the short-run. When employment is used as the dependent variable, the result indicates that changes in output and exchange are inelastic and elastic to employment respectively in the long run. In the short run, changes in output and trade openness in the manufacturing sector are inelastic to employment while the change in the exchange rate is fairly elastic to employment.

The ECM and CCR show that change in the exchange rate is fairly elastic with output and employment. However, change in the exchange rate is insignificant with employment in the short run. The variance decomposition form the SVAR shows that forecast error shock of exchange rate affects output more than employment in the first and second horizons, afterwards then the effect is more prolong on employment. Likewise, the result of the estimation of the Impulse Response Function from the Monte Carlos shows that one standard deviation of the exchange shock adversely affect

employment. In conclusion, the outcome of the results show that the exchange rate has not improved output and employment both in short and long-run. Several factors may be accounted for the outcome of the result, although maybe due to cost-push inflationary pressure and high demand for import goods due to price elastic of local industry in the short run. More so, another contributing factor maybe because of the high importation of raw material that makes the market unfavourable for competition with the foreign counterpart. To improve the situation, the work suggests the need by the Nigerian government to focus more on long-term supply-side policies that will help to increase favourable competitiveness and reduce the cost of production. Finally, the study recommends that future studies should investigate the impact of exchange rate on the disaggregated manufacturing sector.

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Appendix

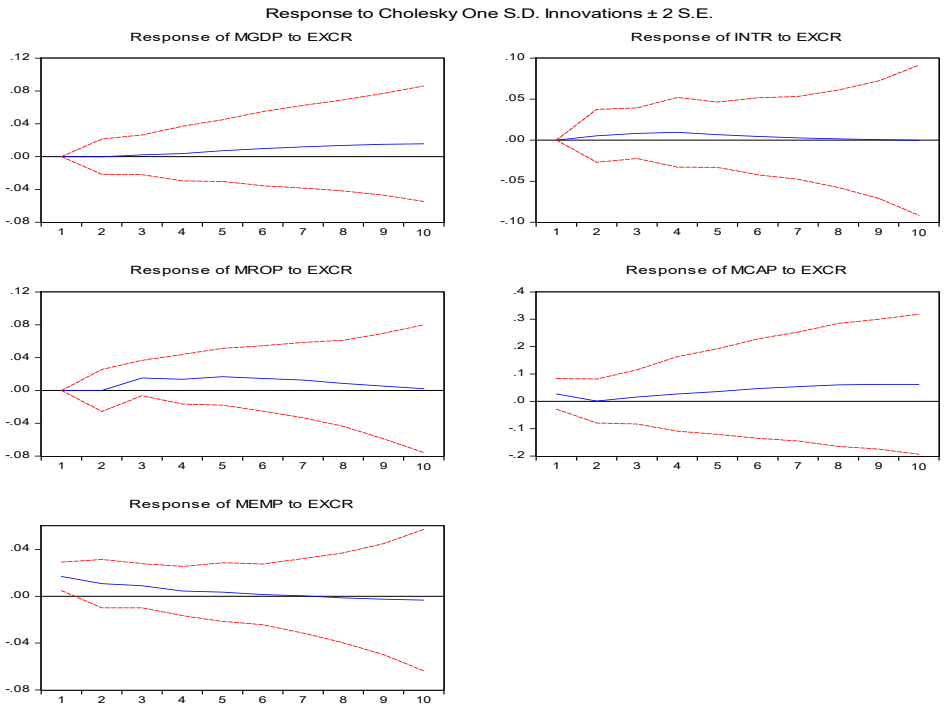

Figure 1: Exchange Rate Impulse Response Function