

Real Exchange Rate Volatility and Sectoral Employment in Nigeria

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Abstract

This study investigated the effects of real exchange rate movements on sectoral employment in Nigeria between 1976 and 2016. The sectors of interest were the agricultural sector, manufacturing sector and the service sector. Error correction model (ECM) was used to investigate the objective of the study via two channels of export orientation channel and imported input channel. The empirical analysis results show that the manufacturing sector feel the greatest effect of exchange rate movement than the other two sectors. Considering the sector's adjustment rate to employment disequilibrium, this shows that manufacturing sector's employment adjust faster (45 per cent per year) than other two sectors followed by agricultural sector. Accordingly, this investigation recommends that manufacturing sector ought to be all around created and legitimate administration of naira ought to be sought after as an instrument to improve the Unemployment circumstance in Nigeria.

Keywords: Real Exchange Rate, Sectoral Employment, Error Correction Model, Export Orientation Channel, Imported Input Channel.

JEL Classification: J45

1. Introduction

The world is a global village where the economies are between associated straightforwardly or potentially in a roundabout way with each other through assets and goods market. These economies are of various dimension of advancements – some developed and others developing. The likelihood of smooth relationship among these economies in this manner relies upon a medium through which trade can be practiced. Foreign exchange plays this imperative job of exchange by guaranteeing the free stream of merchandise and ventures among the countries of the world. The price of foreign currency in terms of local currency monetary standards as far as nearby money (i.e. exchange rate) is in this manner critical to comprehend the development way of all countries of the world (Bastos, 2010),

Clearly, misalignments of exchange rate can result to yield withdrawal, in this way, offering approach to financial hardship. Aghion (2006) observationally offer proof that real exchange rate volatility can significantly affect long haul rate of profitability development, depending fundamentally on a country's level of financial development. For countries with relatively low levels of financial development, exchange rate volatility generally by and large lessens development, though whereas for financially advanced countries, there is no significant effect. Belke and Setzer (2003) likewise bolstered the case by Agion et al that the impact of variability of exchange rate is more felt in the developing countries than in the developed ones

There is a sensibly solid proof that the arrangement of exchange rate impacts the rate of development of per capita yield in low pay countries. Subsequently, Nigeria as a low pay open economy is required to be defenseless against misalignments of exchange rate.

One of the major macroeconomic objectives that can be upset by exchange rate volatility is business. Business is a critical subject of worry for each economy – be it developing or developed. The Unemployment circumstance in Nigeria has been a noteworthy concern. Unemployment rate has been on the expansion in Nigeria since 1970 to date. Unemployment rate ascended from 1.93 percent in 1970 to 23.9 percent in the year 2011. In this manner, government at all dimensions and policy makers have been endeavoring endeavors at improving the circumstance. Several macroeconomic policy measures have been actualized to improve efficiency in distinctive divisions of the economy with the end goal of advancing employment generation. Noticeable among these measures is the exchange rate policy, which has the ability to influence employment both directly and indirectly. In the literature several precise transmission channels through which exchange rate sway on work can be recognized. Among the various studies on employment, analysis of the impact of exchange rates on employment has gotten unimportant consideration. A portion of the current studies that have been done focused generally on the developed countries and non-African developing countries. It therefore becomes necessary to investigate the various channels through which exchange rate movement affects employment (Okonkwo, 2015). Consequently, this study identifies the potential channels through which exchange rate volatility affects employment in Nigeria, with particular focus on the manufacturing, agricultural and service sectors which together employ the largest percentage of the labour force

2. Literature Review

2.1 Theoretical Framework

The volatility of exchange rate is said to have negative impact on the on the export of the developing economies. As indicated by Mahmood and Ali (2011), volatility of exchange rate instigates volatility and hazard in venture choice with destabilizing impact on the macroeconomic performance Clark (1973) model is one of the theories that examine the relationship between the exchange rate volatility and trade flows. It accept an aggressive firm with no market control delivering just a single product which is sold to one foreign market and does not import any intermediate inputs. The firm is paid in foreign currency exports at the current exchange rate, which differs in an eccentric design, as there are

assumed to be no hedging possibilities, such as through forward sales of the foreign currency export sales, for example, through forward offers of the outside money send out deals. Besides, as a result of expenses in changing the size of creation, the firm settles on its generation choice ahead of time of the acknowledgment of the exchange rate and hence can't modify its yield in light of ideal or troublesome moves in the productivity of its exports emerging from developments in the exchange rate. In this circumstance, the changeability in the company's benefits emerges exclusively from the exchange rate, and where the supervisors of the firm are antagonistically influenced by hazard, more noteworthy unpredictability in the exchange rate – with no change in its average level leads to a reduction in output, and hence in exports, in order to reduce the exposure to risk. Grier and Smallwood (2007) presume that exchange rate unpredictability has a huge negative association with the export for developing countries and affirmed that there is no such impact for the advanced economies. Caglayan and Di (2008) credit this to the absence of appropriate money related devices in developing countries that organizations can use to fence against exchange rate hazard. Essentially, Koren and Szeidl (2003) propose that exchange rate unpredictability should influence exchange rate through the covariances of the exchange rate with other macroeconomic factors. Nnanna (2002) joins the impact of exchange rate precariousness on exports to unfriendly financial approach result, swelling, loan cost and development in cash supply.

2.2 Empirical Literature

Numerous studies have researched the impact of exchange rate on export. Extensively, talking, ponders on the impact of exchange rate unpredictability can be recognized regarding proportions of dangers and system of technique of analysis embraced.

Callabero and Corbo (1989) explored the impact of genuine exchange rate volatility on exports for six developing countries (Chile, Colombia, Peru, Philippines, Thailand and Turkey) and found that genuine exchange rate volatility reduced exports in the short-run and the outcomes were generously amplified over the long haul. Co-joining strategy was received by Singh, D. (2010). Looking at the ramifications of exchange rate unpredictability for India's export, the outcomes demonstrated that, exchange rate hazard had a critical unfavorable effect on exports.

Umaru (2013) watched the shakiness exchange rate as a determinant of exchange rate in Nigeria: affecting the needy variable, send out exchange; and at different occasions a negative impact. This proposes a flighty change in its esteem having a long-run impact on export and monetary development. Egert and Spirits (2005) endeavored to dissect the immediate effect of exchange rate unpredictability on the export performance of ten Central and Eastern European transition economies as well as indirect impact by means of changes in exchange rate routines. Aggregate as well as two-sided and sectoral trade streams were examined. To begin with, they broke down movements in exchange rate volatility connected to changes in the exchange rate routines and afterward, they utilized these progressions to build dummy variables that were incorporated into their export work. The outcomes recommend that the size and the course of the effect of for trade unpredictability and of routine changes on exports differed significantly crosswise over divisions and countries and those they might be identified with explicit periods.

Panel data approach was utilized by Omojimite (2010) in investigating the impact of exchange rate volatility on the exchange streams the trade flows of sub-Saharan Africa countries. Gauging exchange rate volatility by the coefficient of variation and utilizing data found that exchange rate volatility had a significantly negative and robust impact on trade flows. The study however, focused exclusively on the fixed exchange rate era and therefore did not investigate the likely impact of increased volatility during the flexible exchange rate period on trade flows. Nigeria's NEEDS document agreed that Nigeria's tariff and trade policies had been characterized by uncertainty and counter policies; to which the government established a market determined nominal exchange rate using the inter-bank foreign exchange market (IFEM), the autonomous foreign exchange market (AFEM), and the Dutch auction system (DAS) at different times to avoid overvaluation of the naira exchange rate and boost non-oil export. At the foreign exchange market, the naira depreciated consistently against major foreign currencies which in theory should have improved export performance as witnessed in China. Findings by De Graauwa (1988) and Caballero & Corbo (1989) of the effect of currency depreciation of individual member countries of the European Union on the export trade of those countries support this idea that currency depreciation affects export trade positively.

Among the empirical literatures that concluded a negative effect of exchange rate volatility on employment are studies by Branson and Love (1987), Revenga (1992), Burgess and Knetter (1996), Goldberg and Tracy (1999), Nucci and Pozzolo (2004), Frenkel (2004), Demir (2008), and Alexandre, et al (2009). While, studies like Ngandu (2008) concluded a positive relationship between exchange rate and general employment; Adewuyi (2005) concluded that that policy variables have no significant effect on the manufacturing wage and employment and Campa and Goldberg (1999), among others, concluded a weaker implications of exchange rates volatility for employment, but more pronounced effects for wages.

Contrary to the conclusion of the above literatures, Campa and Goldberg (1999) found weaker implications of exchange rates for employment, but more pronounced effects for wages, and this conclusion is directly opposite to the study by Revenga (1992). Campa and Goldberg (1999) argued that more substantial effects are picked up in industry wages, especially for industries characterized by low price-over-cost markup ratios, and in overtime wages and overtime employment. According to them, Industries with low price-over-cost markups and those with a less skilled workforce exhibit relatively larger employment elasticities but lower wage elasticities. Evidence in the study supports a statistically significant response of industry wages to exchange rate changes, and a very weak statistical relationship between numbers of jobs and employment and dollar movements.

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elasticities but lower wage elasticities. Evidence in the study supports a statistically significant response of industry wages to exchange rate changes, and a very weak statistical relationship between numbers of jobs and employment and dollar movements.

In a more sectoral investigation, Ewing and Yang (2009) found a long-run relationship between exchange rate and manufacturing employment but no relationship with non-manufacturing employment. Consistent with Ewing and Yang is the study by Bastos and Wright (2010) on impact of exchange rate movements on wage determination in unionised labour markets. They found that organized labour has a rational incentive to impose lower wages in the face of a currency appreciation. In a more general study, Ngandu (2008) in his study of the South African economy, employing a General Equilibrium technique, claimed that whereas a partial equilibrium analysis that only focuses on the manufacturing sector might conclude that appreciation has a negative impact on employment, taking into consideration the economy-wide impacts, there can be an overall positive impact on employment from an appreciation. The four worst-affected sectors in terms of employment according to Ngandu include transport equipment, leather products, chemical products and footwear. The sectors that respond positively to the exchange rate include business services, other producers, other mining, and medical and other services.

Considering the scope and contradictory findings of the above literatures, most of the empirical studies carried out have focused more on the developed economies (particularly the U.S.) and non-African developing economies. Also, few studies exist yet on sectoral analysis as most focused on manufacturing industries. Thus, this study intends to fill these gaps in terms of focusing on Nigeria as its scope and extending the investigation to sectoral analysis.

3. Methodology

The data used for this study are combination of sectoral and aggregate annual data from 1976 to 2016. The sectors of interest are agricultural, manufacturing and service sectors. These sectors are chosen because they contribute the largest share of employment generation in the Nigeria labour market. The model is the basis for our estimation. Data employed are mainly secondary and sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin, United Nations Statistics Division – National Accounts, Federal Office of Statistics, National Bureau of Statistics (NBS) Statistical Fact Sheets, National Account of Nigeria, National Manpower Board (NMB) Data File, National Rolling Plan and Nigerian National Petroleum Corporation (NNPC) Annual statistical Bulletin. All data are measured in real terms and in logarithmic terms.

Established from the theoretical framework, the real exchange rate affects employment through the export orientation channel defined as $(\text{exports}/\text{GDP}) \times \text{real exchange rate}$ and the imported input channel defined as $(\text{imports}/(\text{GDP}-\text{exports}+\text{imports})) \times \text{real exchange rate}$. These definitions are used in previous studies like Campa and Goldberg (1999) and Moonsoo Park (2009). Thus, the specification of the model for estimation in this study is that sectoral employment (L) measured by the number of employees in each sector is a function of export orientation channel (X); imported input channel (M); output demand proxied by the sectoral real output (Y^*); factor prices – represented by real oil prices for

foreign cost of capital (r^*) and interest rate for domestic cost of capital (r); and lagged dependent variable (L_{it-1}).

$$L_{it} = \alpha_0 + \alpha_1 X_{it} + \alpha_2 M_{it} + \alpha_3 Y_{it}^* + \alpha_4 r_t^* + \alpha_5 r_t + \alpha_6 L_{it-1} + \varepsilon_t$$

$\alpha_2, \alpha_3, \alpha_6 > 0; \alpha_1, \alpha_4, \alpha_5 < 0$ 1

The constant term is represented by α_0 , where $\alpha_1 - \alpha_6$ are the coefficients to be estimated and ε_t is the stochastic error term. The a priori expectation in equation 14 above is that $\alpha_2, \alpha_3, \alpha_6 > 0$ meaning a positive relationship with employment and $\alpha_1, \alpha_4, \alpha_5 < 0$ meaning a negative relationship with employment. The “ X ” variable shows that as exchange rate depreciates (that is reduction in value), export is encouraged, and this leads to increase in output and employment. The “ M ” variable describes that as a result of depreciation, production capital input becomes more expensive, and this leads to contraction in output and employment. “ Y^* ” depicts that as output increases, employment increases. “ r^* ” shows that when there is an increase in energy price, cost of production increases and finally resulted to decrease in employment, the same reasoning goes for “ r ”; and “ L_{it-1} ” variable explains that whatever happens to present employment has its connection to the past situation of employment.

In order to arrive at a reliable estimate of the parameters ($\alpha_1 - \alpha_6$), this study investigates the unit root properties of the employed variables using the Augmented Dickey Fuller (ADF) test. After this is ascertained, we test for cointegration among the variables employed for each sector using the Engle-Granger test for cointegration.

After establishing cointegration among variables, this study examines the short-run relationship among variables under investigation using the Error Correction Model (ECM) technique.

The Error Correction Model (ECM) specification for this model is presented below.

$$\Delta L_{it} = \beta_0 + \sum_{k=0}^{\infty} \gamma_k \Delta X_{it-k} + \sum_{j=1}^{\infty} \varphi_j \Delta L_{it-j} + \rho \varepsilon_{it-1} + \mu_t \dots \dots \dots 2$$

$\rho < 1$

Where Δ denotes the first difference operator, all other variables are as initially defined except for “ X_{it} ” which is the vector of explanatory variables, ε_{t-1} is the one-period lagged series of labour demand and u_t is a random error term. The ECM accounts for the short-run dynamics of the model. The equation suggests that ΔL depends on ΔX , ΔL and also on the equilibrium error term. “ ρ ” from the ECM equation is expected to be negative (less than zero) and significant. This condition is necessary because when ρ is positive, it means the model is out of equilibrium, that is, L cannot adjust back to its equilibrium value. Therefore, this makes the model to lack the strength to predict what happens to the dependent variable as a result of variation in the explanatory variables. The absolute value of ρ decides how quickly the equilibrium is restored.

4. Results

In this segment, we present the experimental after effects of the study. The outcomes exhibited are time series tests, cointegration tests and the regression analyses. This is

intended to find out the propriety of the particular and decide the hidden properties of the information developing process. Following this, the experimental outcomes are displayed.

4.1 Unit Root Tests

In order to avoid the misleading characteristics of time series macroeconomic variables which in most cases exhibit non-stationarity in regression analysis, this study examines the time series characteristics of the variables under investigation using the Augmented Dickey Fuller (ADF) test. The reason for this is that non stationarity economic variables involved in economic analysis leads to violation of the classical assumptions of standard regression methods and thus, leads to spurious estimates.

The ADF test tests the null hypothesis that a time series variable Y_t is nonstationary, I(1) against the alternative that it is stationary, I(0). The general framework for the ADF test carried out in this study is presented below. During estimation, we estimated two models from the general framework where the first model suppresses the trend element, (t) and take on the constant term, β_1 and the second model estimates the general framework to accounts for both the constant and trend.

$$\Delta\gamma_t + \beta_1 + \beta_2t + \delta\gamma_{t-1} + \sum_{i=1}^m \alpha_i \Delta\gamma_{t-1} + \mu_t \dots\dots\dots 3$$

Where μ_t is a pure white noise error term and where represents the first difference of the variable of concern. The test here centers on investigating whether $\delta = 0$ (nonstationarity) for the null hypothesis as against $\delta < 0$ (stationarity).

Table 4.1: Results of Unit Root Tests

Variable	ADF				Order of Integration
	Without Trend		With Trend		
	Level	First Diff	Level	First Diff	
Log(A. Emp)	1.8847	-4.7409***	-1.0487	-6.3185***	I(1)
Log(M. Emp)	-1.1557	-3.6462***	-2.1376	-3.6034**	I(1)
Log(S. Emp)	0.3772	-4.0780***	-1.4286	-4.0695**	I(1)
Log(A. Q)	-1.8155	-4.9970***	-2.0943	-5.2647***	I(1)
Log(M. Q)	-2.9801*	-4.2767***	-2.4438	-4.8917***	I(1)
Log(S. Q)	-2.0638	-4.8063***	-2.8347	-5.1300***	I(1)
Log(X)	-1.1069	-5.7906***	-3.0229	-5.7555***	I(1)
Log(M)	-0.9436	-5.5042***	-2.9304	-5.4838***	I(1)
Log(r)	-1.4669	-4.8398***	-0.7421	-5.1109***	I(1)
Log(r*)	-0.9815	-6.1931***	-3.0502	-6.1312***	I(1)

Notes: *, **and *** implies significance at 10%, 5% and 1% level respectively. Critical Values for ADF tests are the following.; In the model without trend: Level form: -3.6067 (1%), -2.9378 (5%) and -2.6069 (10%); First difference: -3.6117 (1%), -2.9399 (5%) and -2.6080 (19%); In the model with trend: Level form: -4.2092 (1%), -3.5279 (5%) and -3.1949 (19%); First difference: -4.2165 (1%), -3.5312 (5%) and -3.1968 (10%).

The after effect of the unit root tests is displayed Table 4.1. The outcome demonstrates that every one of the factors over the three parts are stationary at first distinction meaning it is

I(1). This demonstrates the factors are not stationary at levels but rather in the wake of taking their first contrast, they end up stationary.

4.2 Cointegration Tests

Having set up the unit root properties of the variables, the mix of at least two nonstationary variables could anyway be stationary if these arrangement share a typical long-run harmony relationship. For this situation, these variables are said to be cointegrated. Hence, since time is running short arrangement qualities of the variables, this study further researches utilizing the Engle-Granger (EG) test, the presence of cointegration among variables of concern.

After estimating the regression in equation above and generated the residuals (μ_t), these residuals are thus subjected to the ADF test. The result showed that in the long-run, there exist cointegration among the variables of concern in all the three sectors. The ADF test statistic stood at -5.4362, -3.1388 and -4.7136 for agricultural, manufacturing and service sector respectively, against the critical values of -3.6067, -2.9378, and -2.6069 for 1 per cent, 5 per cent and 10 per cent level of significance respectively

4.3 Error Correction Results

To land at the tight fisted Error Correction Models (ECM) for all the sectors under consideration, we previously evaluated the over-parameterized models that empower us to erase lagged variables that are of no significance in our model. The ECM results for the three segments are exhibited in Table underneath.

Table 4.2: Parsimonious Error Correction Model

Variable	$\Delta L(\text{Agric})$	$\Delta L(\text{Manuf})$	$\Delta L(\text{Serv})$
<i>Intercept</i>	0.034 (3.354)	0.004 (0.287)	0.025 (1.291)
ΔX	0.022 (0.624)	-0.194 (-2.304)**	0.032 (0.362)
ΔM	-0.028 (-0.962)	0.181 (2.902)***	0.072 (1.289)
ΔY^*	0.010 (0.553)	(-1.280)***	0.110 (2.134)**
Δr^*	0.014 (0.589)	(1.010)	-0.067 (-1.182)
Δr	-0.016 (-0.560)	(1.748)*	-0.007 (-0.148)
$\Delta X(-1)$		0.542 (5.258)***	0.115 (2.094)**
$\Delta X(-2)$	0.184 (3.252)***		
$\Delta X(-3)$	-0.065 (-2.426)**	-0.245 (-3.143)***	
$\Delta X(-4)$		-0.279 (-4.731)***	-0.167

Variable	$\Delta L(\text{Agric})$	$\Delta L(\text{Manuf})$	$\Delta L(\text{Serv})$
$\Delta M(-1)$	-0.019 (-1.916)*		(-2.546)**
$\Delta M(-2)$	-0.128 (-2.663)**		
$\Delta M(-3)$		0.182 (2.504)**	
$\Delta M(-4)$			
$\Delta Y^*(-1)$	-0.050 (-2.577)**	0.120 (2.101)**	
$\Delta Y^*(-2)$			
$\Delta Y^*(-3)$			
$\Delta Y^*(-4)$			
$\Delta r^*(-1)$	-0.039 (-2.085)**	-0.299 (-4.505)***	
$\Delta r^*(-2)$	-0.090 (-3.476)***		-0.017 (-1.257)***
$\Delta r^*(-3)$	0.067 (2.402)**	0.107 (2.256)**	
$\Delta r^*(-4)$			
$\Delta r(-1)$		-0.146 (-2.809)**	-0.096 (-2.023)**
$\Delta r(-2)$		-0.170 (-3.238)***	-0.209 (-4.375)***
$\Delta r(-3)$	-0.056 (-2.759)***	-0.097 (-2.130)**	
$\Delta r(-4)$	-0.052 (-1.977)*		0.237 (1.193)
$\Delta L(-1)$	0.298 (1.268)	0.624 (4.217)***	0.270 (1.936)*
$\Delta L(-2)$		-0.487 (-4.259)***	-0.285 (-2.178)***
$e_{cm}(-1)$	-0.352 (-2.263)**		
R^2	0.653	0.819	0.671
$D.W$ Statistic	1.851	1.916	1.889

5. Conclusion and Recommendation

This study investigates the effects of real exchange rate movements on sectoral employment in Nigeria between 1976 and 2016. The sectors of interest are the agricultural sector, manufacturing sector and the service sector. The study utilized Error Correction Model (ECM) in achieving the target of the study by means of two channels of export orientation channel and imported input channel. The ECM results demonstrate that manufacturing sector feel the greatest effect of exchange rate movement followed by the agricultural sector and finally by service sector. Considering the sector's adjustment rate to employment disequilibrium, this study shows that manufacturing sector's employment adjust faster (45 per cent per year) than other two sectors followed by agricultural sector. Therefore, this study suggests that manufacturing sector should be well developed and proper management of naira should be pursued as a tool to ameliorate the unemployment situation in Nigeria.

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