

THE IMPACT OF REAL EXCHANGE RATE FLUCTUATION ON INDUSTRIAL OUTPUT IN NIGERIA

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Abstract

The low productivity and increasing trend of under utilization of resources capacity experience in the industrial sector in Nigeria have been largely attributed to a misalignment in the real exchange rate and some other economic factors, such as, available foreign exchange. The economic literature maintains that exchange rate over valuation arises from unsustainable macro-economic policies such as, restriction of trade, transfer of modern technology; and so on. It was partly in response to this challenge posed by exchange rate misalignment and the consequent declining output experience in the industrial sector that the CBN adopted a number of macro economics measures to reposition the Nigeria economy on the path of sustainable growth. This study, the impact of real exchange rate fluctuation on industrial output investigates the effect of misalignment of real exchange rate on the output of the Nigeria industrial sector. The results show that real exchange rate play a significant role in determining the industrial output and also in addition, availability of foreign exchange increase through contentious export drive from both oil and non-oil products will contribute tremendously to increase industrial output. The study further reveals that the capacity utilization ratio is low the cases of which may not be too far away from, partly epileptic power supply, lack of adequate and appropriate technology and so on and also that the impact in bidirectional (real exchange rate in industrial output and vis-versa).

Keywords: Exchange rate fluctuation, industrial output, Nigeria

INTRODUCTION

The erratic fluctuations in exchange rates also referred to as exchange rate volatility could be described as periods of domestic currency appreciation or depreciation. The exchange rate is therefore an important relative price as it has influences on the external competitiveness of domestic goods. Thus, exchange rate has received considerable attention in terms of its influence on investment and economic growth. Policy makers have often been confronted with the problem of determining an appropriate exchange rate system through which the domestic economy is linked to the global economy. However, the literature is ambiguous about the direction of the effect of real exchange rate on the level of investment. While a real depreciation of exchange rate raises the cost of imported capital goods, which, in turn, would lead to a fall in domestic investment, a real depreciation arising from raising the profitability in the tradable goods sector

would stimulate investment in this sector but depress investment in the non-tradable. However, in an economy that is driven by Foreign Direct Investment (FDI) flows and if the capital stock is optima, a real depreciation of the exchange rate will result in a decline in domestic investment.

In Nigeria, the naira exchange rate witnessed a continuous slide in all the segments of the foreign exchange market (that is, official, bureau de change and parallel markets). In the official market, the exchange rate depreciates progressively from N7.94 per us dollar in 1990 to N81.02 per dollar in 1995 and further to N129.02 in 2003. Similarly, it depreciated from N9.62 and N9.61 per dollar in 1990 to N141.36 and N141.07 per dollar in 2000 in the bureau de change and parallel market, respectively. Consequently, the premium between the official and parallel market remained wide throughout the period. Given the import dependent nature of the Nigerian industrial sector, the continued depreciation of the naira exchange rate vis-à-vis the currencies of other major trading partners, meant that more resource would be needed to increase domestic output. A depreciating exchange rate in the absence of domestic sources for input and inadequate infrastructure will raise the cost of production, which will in turn make locally produced goods less competitive compared to the imported counterparts, thus, reversing the benefit of cheaper exports expected from depreciation of any currency. Similarly, the over-dependence of the economy on imported capital goods implies that a depreciating exchange rate would crowd out marginal investment as a result of high investment cost.

The depreciation in the naira exchange rate has resulted in a shift in finance from the productive sector to the trading sub-sector. This assertion is corroborated by the use to which foreign exchange has been deployed over the years. While the proportion of foreign exchange utilization in raw material imports, machinery and equipment decline, the utilization on finished goods remained high between 2001 and 2011. See table 1.1 below:

Table 1.1 Percentage Foreign Exchange Allocations by End User, 2001-2011

End - Use Category	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Raw Material	37.2	36.1	36.6	35.6	42.6	50.3	46.3	31.5	25.6	21	17.9
Machinery & Equipment	26.6	28.1	25.7	22.2	21.2	17.1	15.6	30.3	15.5	12.6	9.1
Agric Sector Imports	0.6	0.3	0.8	0	2.3	3.2	2.1	1	1.7	1.1	1.7
Finished Goods	25.2	28.7	29.4	33.7	24.2	21.1	28.2	28.4	32.2	25.8	21.4
Transport									2.5	2.4	3.1
Invisibles	10.2	6.7	7.6	8.3	9.7	8.3	7.8	8.8	9.2	8.6	15.5

Source: Central Bank of Nigeria: Statistical bulletin 2011

The exchange rate is generally regarded as reflecting the worth of an economy in terms of another economy. The more the exchange rate depreciates, the lower the value (in real terms) of the goods and services (including salaries and wages of workers) produced in a country vis-à-vis its trading partners. The fact has unfortunately, nationalistic and political colouration to exchange rate management (Nyong 2005: p. 482). Those with strong economic background and conscious

of the need to diversify the Nigerian economy away from oil to non-oil exports will support a depreciating currency which is expected to maintain international competitiveness. However, those with nationalistic and patriotic flavour get uncomfortable and jittery where the exchange rate depreciates against foreign currencies, arguing that it cheapens the economy and makes it easy for foreigners or dominate the domestic economy, thereby perpetrating external dependency. For them, a strong and appreciating currency is considered a source of national pride and aspiration, and is indicative that the economy is doing well.

The exchange value of a country's currency is largely determined by economic forces (called economic fundamentals), with political factors playing only complementary roles. Thus, attempts to impart greater value to a currency by political means probing into the underlying economic forces, may lead to greater instability in the foreign exchange market and unsustainability in the rates. For instance an increase in the terms of trade causes output in the non tradable sector to decline causing an excess demand in non traded goods and shifting the internal balances locus upward. Simultaneously, the external balances (downward sloping) locus shift upwards as well, reflecting the necessity of having an appreciated exchange rate to maintain sustainable trade balance.

Similarly, a positive productivity shock in the tradable sector stimulates expansion in output in the sector relative to the non tradable sector and the exchange rate appreciates. Positive productivity shock improves the trade balances, which also requires a real appreciation to maintain the current account at a sustainable level.

Problem

Recently, there is much debate regarding the policies needed to sustain rapid growth and promote productivity in the industrial sector in Nigeria. Questions about external competitiveness, exchange rate fluctuations, and the appropriate exchange rate policy have featured prominently in this debate.

Taking a somewhat broader perspective, exchange rate fluctuations can have significant effects, for at least two reasons; first, even short-term real exchange rate volatility can impose large welfare costs. Especially in a context of underdeveloped financial markets, where firms and households face cash-flow constraints, such volatility reduces the level of international trade, affects investment decision, and hinders growth possibilities. Second, such welfare costs are magnified in the case of prolonged and sustained exchange rate fluctuation, which can badly distort resource allocation.

It is therefore critical both to understand the main determinants of the real exchange rate and to distinguish between short and long term real exchange rate movements in Nigeria. Macroeconomic policies can then be used to smooth "excessive" short-term changes and to correct any emerging misalignment.

Objectives of the study

1. To determine the impact of fluctuation in real exchange rate on economic growth in Nigeria.
2. To determine the bidirectional relationship between real exchange rate and economic growth in Nigeria.

3. To determine the determinants (determining factors) of real exchange rate in Nigeria.

Research questions

1. Does fluctuation in real exchange rate in Nigeria has any significant impact on economic growth?
2. Is there a bidirectional relationship between real exchange rate and economic growth?
3. What are the determinants (determining factors) of real exchange rate in Nigeria?

Statement of hypotheses

1. H_i: The real exchange rate of Nigeria Naira has significant effect on domestic output growth.
2. H_i: The movement in the domestic output of the Nigerian industrial sector is dominated by fluctuation in real exchange rate.
3. H_i: The determining factors of real exchange rate promote stability and sustenance of economic growth in Nigeria.

LITERATURE REVIEW

There is a substantial theoretical and empirical literature on the long-term equilibrium real exchange rate (ERER). In general, equilibrium real exchange rate is defined as the level of the RER which is consistent with both external equilibrium (i.e. a sustainable current account) and internal equilibrium (in the labour and goods markets). Clark (1994), MacDonald (1995), Hinkle and Montiel (1999) and MacDonald and Stein (1999) provide a good summary of the concept of equilibrium real exchange rate and alternative competitiveness indicators.

Much of the literature has dealt with advanced economies. However, developing countries typically face different sets of structural issues, and a more limited availability of data. Edwards (1988, 1989, 1994) has a seminal attempt to build an equilibrium exchange rate model specifically tailored to developing countries. Here, the RER is defined as the relative price of non tradables to tradables that results in the simultaneous attainment of internal and external equilibrium.

The broad idea is to explore the long-run co-movements of the RER with variables such as the terms of trade, productivity, net foreign assets, the fiscal balance, and measures of openness of the trade and exchange –system. The general finding is that, the RER tends to appreciate with increases in each of the variables.

Edwards's (1988) framework has been adapted and extended by several authors. Khan and Ostry (1991) provide panel data estimates of the elasticity of the ERER with respect to terms of trade shocks and commercial policies. Elbadawy (1994) develops a simplified version of the recent studies include Faruguee (1995), Mongardini (1998) for Egypt, De Broeck and Slok (2001) for transition economies, lane and Milesi-Ferretti (2002) for Ireland, and MacDonald and Ricci (2002) for South Africa.

Various refinements are possible on the basic approach. For instance, Lane and Milesi-Ferretti (2001, 2002b) suggest that the positive relationship between net foreign assets and the RER reflects a negative relationship between:

- (a) Net foreign assets and trade balance and
- (b) The trade balance and the real exchange rate. In a different vein, Clark and MacDonald (1999, 2000) as well as Feyzioglu (1997) for Finland, and Paiva (2001) for Costa Rica, extend the approach to better differentiate between permanent and transitory components of the RER.

All these approaches focus on changes in the RER, but they may also yield insights about its level, so long as assumptions are made about which historical period actually constituted equilibrium. Williamson (1994) pursues a slightly different, more forward-looking approach, postulating instead a normative target for the current account which in turn identifies the desirable Equilibrium Real Exchange Rate (ERER).

In this study, we are looking at a reverse relationship. All the while, an earlier literature has been focusing so much on the real exchange rate as a dependent variable of other economic fundamentals of which productivity is one of the variables. But in the model used in this paper, domestic output of the industrial sector (productivity) is treated as a result (dependent) variable, while the real exchange rate is model as one of the determining variables.

THEORETICAL FRAMEWORK

Empirical studies on estimation of real exchange rate against economic fundamentals, and some other determinants of the exchange rate are not lacking. The focus of some of the research has been to estimate to what extent the economic fundamentals including productivity or output has influenced the direction of movement of the real exchange rate along its path.

Dynamic productivity theory of trade was propounded by Hia Myint. It states that foreign trade by widening the size of the market improves the division of labour and thereby raises productivity within the trading country. The theory interprets trade as a dynamic forces: division of labour permit greater use of the machinery, stimulates innovation, overcome technical indivisibilities, raises productivity of labour and enable countries to enjoy increasing returns to scale and further growth.

Harvey Leibensatein (1966) extended the theory to include X-efficiency. According to him free trade also provides x-efficiency. By x-efficiency it means the pressure of some forces as motivations and so on that cause the firm to purchase and utilize all efficiency inputs so as to reduce cost per unit output. X-efficiency emphasized the importance of motivational elements to increased productivity which enables the firm to produce close to its minimum cost equilibrium. Whereas allocation efficiency improves resources allocation among firms, x-efficiency improved resources allocation within a firm. The x-efficiency argument implies that free trade stimulates firm's production of increased output at minimum cost. It points attention to efficient utilization of factors of production.

EMPIRICAL STUDIES

Empirical evidence has shown strong effect of short-run and long-run adverse effect of exchange rate swings on economic growth performance through the trade channel. The nature of the effect,

however, runs in either position or negative direction. According to IMF (1984) and European commission (1990) empirical evidence in favour of a systematic positive (or negative) effect of exchange rate stability on trade (and thereby growth) in small open economies has remained mixed. Bachetta and van Wincoop (2000) found based on a general equilibrium framework that exchange rate stability on trade.

In most empirical studies, the Gravity models have been used as frame work to quantify the impact of exchange rate stability on trade and growth, in particular in the context of monetary union. Using panel estimations for more than 180 countries Edwards and Levy Yeyati (2003) found evidence that countries with more flexible exchange rate grow faster. Eichengreen and Lablang (2003) found strong negative relationship between exchange rate stability and growth for 12 countries over a period of 120 years. They conclude that the results of such estimations strongly depend on the time period and the sample Schnabel (2003) found robust evidence that exchange rate stability is associated with more growth in the EMU periphery. The evidence, according to him, is strong for Emerging Europe which has moved from an environment of high macro-economic instability to macro-economic stability during the observation period. Other empirical studies examine the role of capital market in ensuring exchange stability and economic growth.

Vamvakidis (1998) study undertook an investigation aimed at finding any relationship between regional trade agreement (RTA) and growth. He focused on whether openness size of population and the gross domestic product (GDP) affect growth of countries that have entered into RTA. The results show that economies with open economics grow faster. He also provided evidence that the level of development on neighbouring open economies have some spillover effect. By contrast, the lead level of development in open economics has no little on domestic growth. Similar studies were done by Langhammer and Heinmenz (1990). Their empirical work found out that regional agreement made up of developing nations has had no significance contributions to trade expansion.

Barren and Sala-Martins (1995) estimated the impact of trade protection on growth. Using tariff on capital goods and intermediate goods as a measure of protect their result indicated negative impact between trade liberalization and growth. Countries with low results according to them grow faster than those with high tariff. This confirms the earlier theoretical literature in favour of trade liberalization.

Boadiary and Trendenick (1978) using static applied general equilibrium (first generation) found that remove or tariff in Canada would cause welfare to declined by about to trade deterioration resulting from an import tariff reduction, as implied by national product differentiation assumption has led Broom (1987) to conclude rather categorically that unilateral trade liberalization is and $E (>0)$ and (<0) - the income elasticities of demand for exports and imports respectively.

Extensive empirical research shows that x/p is a very good predictor of country's long run growth performance, so that allowing for differences INP, income growth and export growth are highly correlated. The conclusive evidence that most developing countries are balance of payment constrained growth rate (or financed by capital inflows) while resources lie idle domestically in these circumstances, export growth will raise output growth by relating balance of payments constraints on demand irrespective of any supply-side effects of capital flows.

In an open economy context the major component of autonomous demand is export growth and faster export growth allows for other components of demand to grow faster. It is possible, as me combine does, to then disaggregate the contribution to growth exports and other components of demand within this demand-oriented framework. Onah (2002) has it that with trade liberalization, the structure of the export trade of developing countries has however, undergone a substantial transformation. Since 19890's with rapid growth in the export of manufacturer, this by the early 1990's and hand come to be the dominant flow of merchandise from developing to developed countries represented three continued to manufacture exports to developed countries represented three times the values of non-oil commodities had exceeded the value of manufactured exports.

METHODOLOGY

The study used the econometric procedure in estimating the impact of real exchange rate fluctuation on industrial output in Nigeria. The Ordinary Least Square (OLS) method of regression was employed in obtaining the numerical estimates of the coefficients of the equation. The OLS was chosen for estimation because of the following reasons:

- i. The OLS is fairly easy to compute as compared to economic methods.
- ii. The mechanism of the OLS is simple to comprehend and interpret.

Finally, the parameters estimated by the OLS methods have some desirable optical properties. They are best, linear, unbiased estimator (BLUE) since the regression we shall evaluate the parameters using an econometric package.

In demonstrating the application of Ordinary Least Square (OLS) method, multiple regression analysis was used. Our model was specified using log of industrial output (LINDOUT) as the dependent variable. While macroeconomic variables such as log of real exchange rate, capital utilization rate, export, and technology were used as independent variables (explanatory variables). Specifically, the model is specified in the functional form as follows:

$$\text{LINDOUT} = f(\text{LRER}, \text{CUR}, \text{LEXPTS}, \text{TECHY}) \dots \dots \dots (i)$$

Where:

LINDOUT = log of industrial output

LRER = log of real exchange rate

CUR = Capital utilization rate

LEXPTS (-1) = log of one year lag of exports as proxy for available foreign exchange.

TECHY = Technology

The model is further specified in linear form as follows:

$$\text{LINDOUT} = \alpha + \beta_1 \text{LRER} + \beta_2 \text{CUR} + \beta_3 \text{LEXPTS} (-1) + \beta_4 \text{TECHY} + \mu \dots \dots \dots (ii)$$

Where:

α = Intercept of the entire regression model

β_1 = Slope of LRER

β_2 = Slope of CUR

β_3 = Slope of LEXPTS (-1)

β_4 = Slope of TECHY

μ = Stochastic error term

APRIORI EXPECTATION

Economic Apriori Expectation

This refers to the sign and size of the parameters in economic relationship. The a priori expectation of the model are $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$, $\beta_4 > 0$. This shows that the set of explanatory variables are expected/assumed to be directly related to the industrial output. The data used in this study were collected from secondary sources. These include relevant textbooks, journals, internet, National Bureau of Statistics (NBS) bulletin, Nigeria Economic Society (NES) publications, Central Bank of Nigeria (CBN) publications and World Bank publications. Our data set spanned a period between 1990 and 2012.

DATA ANALYSIS AND RESULTS

This section present the results of estimating the model outlined in methodology, and compare the results of the study with those of other studies for transition economies and commodity-exporting countries. It is important to state that, given the significant uncertainties involved in specifying and estimating this sort of model, particularly in the context of a transition economy, the paper widely engaged in a broad specification search, and in particular drop several variables that prove to have the wrong signs. This should be born in mind when examining the reported standard errors.

The empirical results of the study is presented below:

$$\text{LINDOUT} = 9.1535 + 0.0471\text{LRER} + 0.0044\text{CUR} + 0.1032\text{LEXPTS} (-1) + 0.0056\text{TECHY} \\ (+32.938) ** (+2.3413)* (+2.1057)* (+2.8704) ** (+0.5553)$$

$$R^2 = 0.787991, \text{ Adjusted } R^2 = 0.758748, \text{ D.W} = 1.561081,$$

$$\text{F-statistic} = 26.94662 (\text{Prob.} = 0.0000) **$$

* Denote significance at 5% level

** Denote significance at 1% level

As shown above, the following findings are sustained:

- An increase in the real exchange rate of 1 percent is associated with about 0.05 percent increase in industrial output.
- An increase in capacity utilization of 1 percent is associated with about 0.004 percent increase in industrial output.
- An increase in export (one year lag) as proxy for available foreign exchange of 1 percent is associated with about 0.10 percent in industrial output; and
- An increase in technology of 1 percent is also associated with about 0.01 percent in industrial output.

The overall result is significant at 1 percent level as indicated by the probability of the F-statistics, which implies that the hypotheses are up held.

In order to assess the robustness of the results, we first examine the signs of the coefficients of all the explanatory variables, which are all positives and in conformity with a priori expectation. However, the magnitude of the coefficient of capital utilization rate and technology are very low relative to that of real exchange rate and exports (-1), which further lend credence to the fact that the real exchange rate (RER) has more influence on the industrial output of a country that its industrial sector is dependent on foreign intermediate goods for its production process, typical of Nigeria. In the same vein, availability of foreign exchange will

have the same effect on industrial output as its found in the real exchange. Not surprisingly, the coefficient of the log of exports lags one year-which is proxy for availability of foreign exchange in the model is the positive and high.

The statistical significance of real exchange rate, capacity utilization rate, and export lag one year-as proxy for availability of foreign exchange, is an evidence that industrial output in Nigeria is strongly influence by these variable which also in agreement with previous studies. For instance Edwards (1986, 1989, 1994) had model real exchange rate specifically tailored to developing countries against economic fundamentals of which productivity is inclusive and found a positive relationship. Elbadawy (1994) develops a simplified version and Faruquee (1995), Mongardini for Egypt, De Broeck and Slok (2001) for transition economies, typical of Nigeria, Lane and Milesi-Ferreti (2002) for Ireland and MacDonald and Ricci (2002) for South Africa. In a different vein, Clark and MacDonald (1999, 2000) as well as Feyzioglu (1997) for Finland and Paiva (2001) for Costa Rica showed positive supports. Since these studies have confirmed a positive relationship between RER and productivity (output), in this study we have further established that the positive relationship is bi-directional, that is, the real exchange rate and some other economic fundamentals also determines the industrial output, particularly in Nigeria and generally in a resource-dependent economies, where the industrial production depend on foreign intermediate good.

CONCLUSION AND RECOMMENDATIONS

From the findings, it can be concluded that the movement (increase/decline) in the industrial output in Nigeria could be explained, among other factors, by the movement experienced in the Real Exchange Rate (RER), the Capital Utilization Ratio (CUR), available foreign exchange (proxy by one year lag of export), and the level of technology.

In view of the above findings and conclude, this paper recommends that:

- (1) The effort of the government should be geared towards maintaining a stable and sustainable exchange rate, since the stability of these could enhance industrial output.
- (2) The availability of foreign exchange is one of the determining factor for enhanced industrial output, hence, foreign exchange should be made available to the industrial sector through consencious effort towards export drive.
- (3) Capacity utilization ratio and technology have to an extent, influence industrial output, the government should provide enabling environment for instance constant power supply, adequate security of life and properly and modern technology for industrial sector to thrive.

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