Impact of Interest and Exchange Rates on the Performance of the Nigerian manufacturing sector

Helen Douglas
Department of Economics
Taraba State University, Jalingo
Saba.heldogg11@yahoo.com.economics
08030943357

Eche, Emmanuel
Department of Economics
Federal University Wukari
lecheznk@yahoo.com (08063840405)

Adi, Daniel
Department of Educational Administration
Federal University of Agriculture, Makurdi
lordswillgrace@yahoo.com/adigracedaniel@gmail.com

Abstract

The main focus of this study is to evaluate the impact of interest and exchange rates on the performance of the manufacturing sector and in pursuance of this; the multiple regression analysis was used to evaluate the impact of interest rate and exchange rate on the performance of the manufacturing sector. According to the result of the analysis, interest rates do not have a significant impact on the performance of the manufacturing sector. But this is contrary to economic reasoning and so we advocated for more extensive study on this area. Exchange rates showed a significant inverse relationship with the performance of the manufacturing sector within the period covered.

Keywords: Interest Rate, Exchange Rates, manufacturing sector

1. Introduction

Manufacturing involves the conversion of raw materials into finished consumer goods or intermediate goods or producer goods. The manufacturing sector is a subset of the industrial sector, others being processing, craft and mining sub-sectors. Manufacturing like other industrial activities, creates opportunity for employment, helps to boast agriculture, help to diversify the economy, while helping the nation to increase its foreign exchange earnings. It also minimizes the risk of overdependence on foreign trade and leads to the fullest utilization of available resources.

Nigeria is endowed with numerous natural resources which could be used as raw materials for manufacturing to serve her domestic needs and also for exports. These resources include minerals such as petroleum, limestone, tin, columbites, kaoline, coal zinc, gypsum, clay, shale, marble, graphite, iron ore, stone etc. Nigerian is also an agrarian society. Nigeria has the capacity to produce a wise range of agricultural products which could be food crops or cash crops. These include oil palm, cocoa, cotton, maize, guinea corn, yam, rice etc. all these can be used in the manufacturing industry as raw materials.

In the 1960's, there was a vigorous policy of import substitution. But this marked the beginning of decline for the export oriented processing of raw materials. The policy of import substitution was mostly initially meant to reduce over-dependence on foreign trade and save foreign exchange. However, it turned out to be a mere assemblage of those items rather than manufacturing. The original aim of import substitution was defeated since almost every item needed by the so-called manufacturing industry was imported. During this time, foreign ownership of manufacturing facilities reached its peak.

In the 1970's, the advent of oil and the enormous resources it provided for direct government investment in manufacturing made the government exercise almost a complete monopoly in the following sub-sectors of manufacturing; basic steel production, petroleum refining, petrochemicals, liquefied natural gas, edible salt, flat steel plants, machine tools, pulp and paper (basic), yeast and alcohol and fertilizer (Nitrogenous phosphates). During the period, the indigenization programme was also initiated; however, the results were poor.

In the 1980's, due to the dwindling government revenue as a result of all in oil prices at the word market, many attempts to stimulate the economy was made. This includes the adoption of export promotion strategy on the realization of the pitfalls of the import substitution strategy. The structural adjustment programme which began in July 1986 emphasized this strategy especially as it relates to non-oil exports, hence the extension of export promotion, incentive of various descriptions. When Nigeria's economic crisis deepened, the plight of the industrial sector became more apparent. This is clearly shown by the negative growth of the industrial output in 1985. it thus became glaring that the so-called big industrial base was built on a very weak foundation. Structurally, most of the industries were plants for the assembly of foreign products for Nigerian market while the domestic resources content of the products of these industries were very low. Moreover, due to the capital-intensive nature of most of these industries, little scope existed for them to explore and efficiently utilize the abundant labour and other local resources in the country. What was observed was the establishment of large plants with huge installed capacities and an import-dependent raw materials requirement. Exchange rate is simply the price of one currency in terms of another. It is the amount of the foreign currency that may be bought in terms of the domestic currency. Ochejele (2010) . One of the distinguishing features of international trade is the involvement of foreign currencies. Nigerian manufacturing is highly dependent on imports of inputs and capital goods. These are paid for in foreign exchange rate and manufacturing output sector. Also, it follows logical reasoning that reduction (depreciation) of the exchange rate will increase foreign direct investment and this may in turn affect manufacturing output positively and vice versa. This provides a link between manufacturing output and the exchange rate.

Interest rate is the percentage of the principal that is paid as a fee over a certain period of time; to the lender of the fund. In economics, it is often referred to as the cost of credit or cost of capital. en.wikipedia.org/wiki/interest, Manufacturing is a capital intensive venture. One of the major sources of financing capital venture such as manufacturing is borrowing from financial institutions, thus, the link between interest rate and manufacturing output.

2. Conceptual Clarifications

Industrialization plays a significant role in economic development. But industrialization includes the development of the manufacturing sector. Industrialization acts as a catalyst that accelerates the pace of structural transformation and diversification of the economy. It enables a country to fully utilizes its factor endowment and to depend less on foreign supply of finished goods or raw material for its economic growth, development and sustainability, Obasan and Adediran (2010)

The contribution of the manufacturing industries in the economy cannot be overemphasized when considering its employment potential and financial impact on the economy. Apart from its building ground for development by laying solid foundation for the economy, it also serves as import substituting industry and provide ready market for intermediate goods Adediran,(2008) According to Aderibigbe (2010), manufacturing industry contributes significantly to the nations economic development in the following ways:

Increase in government revenue through tax
Manufacturing no doubt leads to industrialization: the bigger the number of manufacturing industries, the better industrialized the society will be. Improvement in the standard of living: With manufacturing potentials, more of the people will be gainfully employed in various manufacturing activities, per capita income may increase and the general standard of living improved.

Infrastructural Growth: Construction of good roads to areas where raw materials are exploited and citing of manufacturing industries to these sources of raw materials may help improve the growth of basic infrastructural requirements.

Contribution to Gross National Product: The manufacturing sector in Nigeria being next to oil has through their operations contributed to the Gross national Product of the country through earning from exportation of manufactured goods.

Employment Generation: Manufacturing industry performs the major role of employment generation at all levels i.e. skilled, semi-skilled and unskilled labour and thereby fulfilling one of the nations ultimate macroeconomic goods. Okejiri (2008) revealed that one of the largest constraints to the high productivity of Nigeria's manufacturing is the low level of technology.

3. Methodology and Analysis
To satisfy the objectives of this study, it is important to determine the relationship existing between the performance of Nigeria manufacturing sector (measured by the percentage contribution of manufacturing to GDP) and the interest and exchange rate. Secondary data will be employed in this work. Data will be collected for X1 (Exchange rate), X2 (interest rate) and Y (The percentage contribution of manufacturing to the Gross Domestic Product) from the year 2011-2014. Y is a dependent variable while X1 and X2 are independent variables. The study is quantitative in nature.

This therefore, requires the regression analysis as a tool to determine this relationship. The percentage contribution of manufacturing to GDP is a dependent variable while the interest rates and exchange rates are explanatory variables. The multiple regression model is to be used as shown below $Y = F(X_1, X_2) + £$ Y is the dependent variable representing the percentage contribution of manufacturing to GDP; X_1 is an explanatory variable representing interest rates and X_2 is also an explanatory variable representing exchange rate. £ Is assumed to be the random error representing the discrepancy in the approximation. It accounts for the failure of the model to fit the data exactly. The function f(X1, X2) describes the relationship between X1, X2 and Y. The function $f(X_1, X_2)$ that best fit the data will be used in this work. Assuming a multiple linear regression model $Y = B_0 + B_1 + B_2 + £$ Bo, B_1 and B_2 are called regression parameters or coefficients. They are the unknown constants to be estimated from the data.

The coefficient of determination, R_a^2 of the model will be determined. This value shows how much the explanatory variables explain the outcome of the dependent variable.
It is estimated thus:

$$R_a^{2=1} \underline{SSE/n-p-)}$$
$$SST/(n-1)$$

The R_a^2 measures the extent of fit in percentage.

Analysis of variances for the regression model will be carried out. It will measure the significance of fitness of the model to the data using the F-test. The F-test is given as:

$$F = \underline{MSR}$$
$$MSE$$

SSE is the sum of square errors, SST is the sum of square total, MSR is the mean square of regression and MSE is the   mean square of error. The significance of the individual coefficient estimated shall be determined. This is done by using the t-test.

$$t_j = \underline{B_j - B_j^0}$$
$$S.E(B^j)$$

With (n-p-1) degree of freedom, where P is the number of the explanatory variables and n is the number of observations.

The Durbin Watson D. value will be determined. This detects the presence of autocorrelation in the residuals. Once autocorrelation in the residuals is detected, then the regression model has violated one of its fundamental assumptions, and therefore cannot be used. D is calculated as:

$$D = et^2$$
$$t-2$$

Results and Discussions

The regression model employed that fits the data is the quadratic form with only the explanatory variable (exchange rate) taking the second order, while the other explanatory variables (interest rate) remains in the first order.

$$Y_t = B_o + B_1 X_{1t} + B_2 X_{2t} + B_3 X_2 + C t3t$$

Time	Total GDP	Manufacturing	Interest Rate	Exchange Rate	% Contribution of Manufacturing to GDP
2011	23842171	543259.4	18.71	118.8605	2.28
2012	23952171	553469.4	19.72	128.8805	2.34
2013	25883172	663568.5	22.82	137.899	3.28
2014	36886164	773467.6	24.86	149.798	3.40

Source: Central Bank Statistical Bulleting 2014

Table 1: Model Summary

Model	R	R Square	Adjusted Square	Std. Error of the Estimate	Durbin Watson
1	0.950	0.902	0.875	0.49111	1.112

Predictors: (Constant) Sqr-Exchange, Interest, Exchange
Dependent Variable: Percentage contribution of manufacturing sector to total GDP

From table 1, adjusted R^2 is 0.875. This implies that 87.5% of the explanatory variables (exchange and interest rates) explained the outcomes of the response variable (percentage contribution of manufacturing sector to the total GDP).

The Durbin Watson, D, value is 1.112. Testing for the significance of the D value, the critical lower and the upper limit values of the Durbin Watson are 0.814 and 1.730 respectively. Since D_L (=0.814) = D = 1.112) = Du (=1.730), the test is inconclusive, therefore, we say there is no sufficient evidence that the residuals of the regression model are auto correlated. This implies that the regression model can be for the study.

Testing the significance of the model of the data, we test the following hypothesis:

Ho: B = 0 (model is inadequate)

H1: B   0 (model is adequate)

Table 2. ANOVA

Source Variation	Sum of Squares	df	Mean Square	F	F-Table
Regression	24.409	3	8.136	33.734	3.59
Residual	2.653	11	0.241		
Total	27.062	14			

a.   *Predictors: (Constant) Sqr-Exchange, Interest, Exchange*
b.   *Dependent Variable: Percentage contribution of manufacturing sector to   total GDP*

From table 2, the F-statistic is 33. 734 while the critical value $F_{3,11;0.025}$ = 3.59 . Since the F (=33.734) > F-table (=3.59), we reject Ho and conclude that the regression model employed is adequate. Testing for the significance of the interest rate estimate of the regression coefficient (parameters);

Ho: B1 = 0 (interest rate insignificant)

H1: B1   0 (interest rate significant)

Table 3: Coefficient

	Un-Standardized Coefficients		Standardized Coefficients	t	t-table
	B	Std. Error	Beta		
(Constant)	27.898	5.925	0.169	4.709	2.20
Interest	0.73	0.041	-7.004	1.772	2.20
Exchange	0.444	0.116	6.143	-3.833	2.20
Square Exchange	0.002	0.001		3.361	2.20

a. *Dependent Variable: Percentage contribution of manufacturing sector to total GDP*

From table 3, t-statistic test for the significance of the estimate of the parameter. Interest rate is 1.772. The critical value is $t_{15-3-1, 0.025}$ (2.20).

Since t_{cal} (=1.772) < tt_{ab} (= 2.20). We do not reject Ho and conclude that the estimate for the parameter interest rate is not significant.

Testing for significance of the parameter of exchange rate estimate in the regression model,

Ho: B_2 = 0 (exchange is insignificance)

H1: B_2 0 (exchange rate is significance)

From table 3, the t-statistic testing the significance of the estimate of the exchange parameter is -3.833. The critical value $t_{15-3-1, 0.025}$ (2.20).

Since T_{cal} (= 3.833) > T_{tab} (= 2.20), we reject **Ho** and

conclude that the estimate for the parameter exchange rate is significance. Testing for the significance of the estimate of the parameter Square of exchange rate in the regression model,

Ho: B3 = 0 (square of exchange rate is insignificant)
H1: B3 0 (square of exchange rate is significant)
From table 3, the t-statistic testing significance of the estimate of the square of exchange rate is 3.361. The critical value $t_{15-3-1, 0.025}$ (2.20).
Since t_{cal} (3.361) > T_{tab} (= 2.20) we reject Ho and conclude that the estimate for the parameter square of exchange rate is significant.
Therefore, the regression equation is,
Y = 27.898+0.073 interest – 0.444 exchange + 0.002 square of exchange, Y is the percentage contribution the Nigeria manufacturing sector to the total GDP.

Interpretation of Results
It therefore implies that, keeping exchange rate fixed, for every unit increase in interest rate, the percentage contribution of manufacturing sector to the total GDP increases by 0.073 units. Also, keeping interest and the square of exchange rates fixed, for every unit increase in exchange rate, the percentage contribution of manufacturing sector to the GDP decreases by 0.444 units.

Furthermore, Keeping interest rate and exchange rated fixed, for every unit increase in the square of exchange rate, the percentage contribution of manufacturing sector to the total GDP increases by 0.002 units.

Economic Implication
Logically, it is expected that the level of interest rate should significantly affect the performance of the manufacturing sector. This is because interest represents the cost of capital to manufacturing. According to economic theory, it is also expected that the higher the price, the higher the supply, and the lower the demand. This implies that a high interest rate which translates to high cost of capital will discourage the demand for capital for manufacturing. This will pose the problem of inadequate capital as a result of its exorbitant price. This will lead to poor performance of the manufacturing sector. The result of this study does not support these.

According to the result, interest rate has an insignificant impact on the performance of the manufacturing sector. More research is needed to identify the reason for this. However, possible explanations for this include:
The model does not include all the factors that affect the performance of the manufacturing sector. This suggests that the level of interest rates may actually have a significant relationship with the performance of the manufacturing sector but the impact of other factors affecting the performance the manufacturing sector may have countered this. For instance, if CBN enforces a lower rate of interest but power supply becomes hopelessly erratic, the fall in interest rate may not have a significant impact on the performance of the manufacturing sector. Investors may not be taking adequate advantage of reduction in interest rates because of the collateral requirement demanded by commercial banks before granting loan.

It is possible that the manufacturing sector is being excluded and does no benefit from reduction in interest rate. This is because the CBN do not permit preferential treatment to be accorded to any sector since 1986 and the commercial banks which are driven by profit motive will prefer to loan capital to sectors with higher returns and, or lower risks. As a result funds may not flow to the manufacturing sector in adequate measure. This study covers 2008 to 2012 during which the CBN pursued a market-determined interest rates regime.

The result of the regression analysis shows the exchange rate has a significant inverse relationship with percentage contribution of manufacturing to total GDP. This in line with what is expected. This is because as exchange rates increases, it will be more expensive to procure manufacturing raw materials and equipment from foreign countries. This will result to a negative impact on the performance of the manufacturing sector. This is especially true for Nigeria considering the fact that she is import-dependent.

Recommendation
Based on the discussions and the results of this study, the following are recommended.
a.   The Central Bank of Nigeria should take into proper consideration the idiosyncrasies of the economy before adopting any exchange rate policy as this can have serious implications for the manufacturing sector.
b.   Researchers should embark on a more extensive research on the impact of interest rates on manufacturing and factors that determine the flow of capital to the manufacturing sector.

Conclusion
From the foregoing regression analysis, the interest rate does not significantly affect the performance of Nigeria manufacturing sector. But this is not expected and so, further studies need to be conducted in this area.

According to the result of the regression analysis, exchange rate significantly affects the performance of Nigeria manufacturing sector. Exchange rate and the percentage contribution of manufacturing to the total GDP exhibit an inverse relationship.

REFERENCES

Adewuyi A. O. (2006), *Trade Policy Reform and Technical Efficiency in Nigerian Manufacturing Sector.*

Ajayi O. A.(2008), *The Collapse of Nigerian Manufacturing Sector.*

Aloa R. O. (2010), *Interest Rates Determination in Nigeria: An Emic X-Ray.*

Anyanwu I. C. et al, (1997), *The Structure of the Nigerian Economy*

Elumelu (2002), *Interest and Exchange Rates Management in Nigeria: Micro-Economic Implications*

Iyoha and Oriakhi (2002), *Explaining African Economic Growth Performance:* The Case of Nigeria.

Mustapha and Goh (2010), *Literature Review of Past and Present Performance of the Nigeria Manufacturing Sector*. Proceedings of the Institution of Mechanical Engineers; Part B: Journal of Engineering Manufacturing.

Obokoh and Ehiobuche (2010); Globalization of Finance. *Analysis of the Impact of Exchange Rate Deregulation on Small and Medium Sized Enterprises Development in Nigeria.*

Ojuwo and Adekoya (2010); impact analysis of interest rate deregulation on the Nigerian Economy NES review, 14(1), 20-25.

Opaluwa and Ameh (2010), *The Effect of Exchange Rate Fluctuations in the Nigerian Manufacturing Sector*.