

Macroeconomic Variables and the Productivity of the Manufacturing Sector in Nigeria: A Static Analysis Approach

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Abstract

This paper empirically investigates the impact of macroeconomic factors on manufacturing productivity in Nigeria over the period 1975-2011. The analysis starts with examining stochastic characteristics of each time series by testing their stationarity using Augmented Dickey Fuller (ADF) test and estimate error correction mechanism model. The findings were reinforced by the presence of a long-term equilibrium relationship, as evidenced by the cointegrating equation of the VECM. Our findings show that credit to the manufacturing sector in the form of loans and advances and foreign direct investment have the capacity to sharply increase the level of manufacturing productivity in Nigeria, while broad money supply has less impact. The study, therefore, recommends that government must create "enabling environment" for manufacturers in the area of infrastructure, financial, legal and property rights. High cost of borrowing is due to high interest rate spread. Therefore, this paper advocates a cut in margin between lending and deposit rates. For a resounding performance, the establishment of Microfinance Banks, Small and Medium Industries Equity Investment Scheme and Small and Medium Enterprises Development Agencies of Nigeria, Bank of Industry should be overhauled for development and improvement in the local production. Also, efforts should be made to achieve a more realistic and stable trade balance through liberalization (through FDI) that will guarantee output growth in the both short and long run.

Keywords: *Macroeconomic Variables, Manufacturing Sector, Static Analysis*

1. Introduction

The path to economic recovery and growth may require increasing productive inputs such as land, labour, capital and technology and or increasing their productivity through with a bumpy roads to stability in the face of the global economic meltdown (Alao, 2010), but the changes in the macroeconomic policy have become increasingly significant within the productivity sector as manufacturing has become more capitalized and more dependent on international markets, as a result of this, the sector is being more vulnerable to variations in interest rates, exchange rates, the size of gross domestic product, foreign direct investment etc.

Investigations and explorations by scholars have been showing that higher productivity is a sure means of boosting economic growth and raising standards of living in any country. Formulating and implementing effective productivity schemes have helped to pull many economies out of global recession and set them on the course of growth. This would imply a quantum leap in output of goods and services. Increasing productivity should be the focus because many other countries that have found themselves in the same predicaments have resolved them through productivity enhancement schemes. For instance, Japan from the end of the World War II and the United States of America from the 1970s have made high productivity as the centre point of their economic planning and the results have been resounding (Anyanwu, 2004; Alao, 2010).

In Nigeria, the manufacturing sector is favoured based on the fact that it is a general notion that the main instruments of rapid growth, structural changes and self-sufficiency lies in the manufacturing sector, thus resources have been channeled into the preferred sectors through heavy public sector investment predicated on import substitution strategy of level protection for private investment (Anyanwu, 1993). Industrialization in Nigeria seems to be at the cross roads given that for these pursuits of the strategy would lead to a more inefficient resources usage, intensified foreign exchange constraints, high cost and balance of payment difficulties This is paradoxical given that the industrial sector is theoretically at least expected to have the capacity to innovate and thus exude the dynamism that affect the other sector of the economy.

Due to the ongoing process of economic reforms along with the liberalization measures, Nigerian economy has been facing challenges in terms of both external shocks and internal issues. The external shocks include a phenomenal increase in the foreign capital outflows, exchange rate volatility, oil shocks and contagion effects. Internal structural issues have been in terms of slow pace of legal and lack of social security system, industrial restructuring, Non-Performing Assets in the banking sector, etc., which have been causing hindrance to the reform process. Macroeconomic uncertainty has given rise to several risks impinging on banks, mutual funds, financial firms and

non-financial firms. Macroeconomic risks in terms of exchange rate, inflation, interest rate and liquidity risks would translate into the financial performance of the entities, companies and financial institutions. For instance, banking sector fragility can be attributed to the credit risk or the risk of loss resulting from counter party default.

Also, the role of institutional framework, interest rate policy and other macroeconomic variables in the development of Nigerian manufacturing sub-sector have not been fully addressed and the impact has not equally been fully felt. Manufacturing sub-sector in Nigeria has been experiencing a stunted growth and its contribution to gross domestic product has remained low. For instance, the manufacturing sector declined from about 70.1% in 1980 to just 44.3 percent in 2009 (CBN, 2009).

However it is observed that all the strategies put in place by Nigerian successive governments to reinvigorate and strengthen the Nigerian manufacturing sector has not only led to isolated growth but also generated a relatively small modern sector employment with its attendant capital intensive methods. The capital intensive structure of these industries is anchored on the labour savings obtained by replacing the technology of their parent firms in metropolitan nations substituting plants. The potentials and opportunities for SMEs in Nigeria to rebound and play the crucial role of engine of growth, development and industrialization, wealth creation, poverty reduction and employment creation are enormous (Momoh, 2012).

The sub-sector continued to experience challenges with accessing credit from the banking sector, which in turn affected the importation of raw materials. In addition, the delay in the passage of the 2009 Appropriation Act by the National Assembly affected the business and investment plans of manufacturers. Others were the epileptic supply of electricity and the increased pump price of diesel used mainly in the private provision of electricity (CBN, 2009). This poor manufacturing performance has been attributed to high production cost as a result of high cost of foreign exchange, high interest rate, poor demand, incessant poor description, insufficient raw materials supply, inadequate working capital and frequent machine break downs. All these occurrences coupled with inadequate finance snow-balled into low capacity utilization.

What is more, even though Nigeria has consistently designed industry as the engine of growth of the economy, the government has tended to regard industry only in the short-term economic consideration with industries paying little or no attention to environmental and health issues. Furthermore, the continuing harassment of companies by some state and local governments over unauthorized multiple levies and charges in spite of the law, creates a significant disincentive for business and consequently frequent disruption of production occurs. Inadequate and inefficient

infrastructural facilities which tend to escalate cost of operation as Nigeria manufacturers are forced to resort to private provision of utilities such as road, water, electricity etc.

The main research question that steer this paper is, “what extend do macroeconomic variables such as exchange rate, consumer price index credit to the manufacturing, interest rate and credit to the manufacturing, broad money supply and foreign direct investment determine the productivity of the manufacturing sector in Nigeria?” The general objective is to empirically investigate the impact these factors on the manufacturing productivity in Nigeria.

The paper is divided into six sections; the first section gives a general introduction to the phenomenon of remittances and background of the paper stating its problem and its objectives. Section 2 looks into the review of existing and related literature on the topic, while section 3 presents the research estimation strategy. Section 4 discusses the empirical results of the paper and section 5 is the policy implication and recommendations while, section 6 concludes with a brief.

2. Brief Review of Literature

Few theoretical and empirical studies have investigated the relationship between manufacturing productivity and a range of macroeconomic factors. One way of linking this is to regress some of these selected macroeconomic factors on manufacturing productivity. The term “productivity” can be simply summarized as the rate of real output per unit of input. It can also be largely referred to as the relationship between production of an output and one, some, bundle or all of the resource inputs (labour, equipment, capital and technology) used in accomplishing the assigned task. It is measured as a ratio of output per unit of input over time. It is a measure of efficiency and is usually considered as output per person-hour. Productivity can be expressed as the following ratio of the real output to input. An increase in productivity is said to occur when more output is produced either with the same amount of input, or with less input, or with little increment in input.

Anyanwu (2004), Adekoya (1987) and Udo-Aka (1983) gave two sub-concepts of productivity: (a) Total-Factor Productivity: this is the ratio of output to the aggregate measure of the inputs of all the factors of production. (b) Partial Productivity: this estimates the ratio of total output to a single input, usually, labour. The productivity of labour can be measured either as output per operator or output per man-hour, expressed in money value (economic productivity) or in quantities (physical productivity). Because of the heterogeneity of output, it is more usually expressed in value terms which, for the manufacturing sub-sector, are easily calculated from ex-factory prices of finished products,

estimated value of semi-finished products and other works and services of an industrial nature.

On the issue of interest rate and manufacturing productivity, Sundararajan (1987) examined the linkages among interest rates, the debt–equity ratio of firms, the overall cost of capital, savings, investment and growth in the Korean economy during 1963–81. He used a dynamic framework that recognizes the complex interactions among these variables. According to him, a change in the administered interest rate affects the unregulated rate, the overall cost of capital, the real interest rates and the debt-equity choice of firms. This thereby sets in motion a chain of responses influencing the desired level of the capital stock and its profitability, as well as the availability of savings and the consequent speed of adjustment of the actual capital stock to the desired level. Further, Sundararajan (1987) asserts that the debt-equity ratio is important because the overall cost of capital to investors, which influences fixed investment, its efficiency and profits, can be expressed as a weighted sum of the opportunity cost of bank debt and that of equity – with the weights depending on the debt- equity ratio. Therefore, the multiplier effects of changes in the cost of bank debt (i.e., the interest rate) on the overall cost of capital, and hence on investment incentives and the productivity of capital, depend, among other things, on the share of debt in investment financing and on the induced adjustments in this share, and in the cost of equity. By implication, there exists an optimum debt-equity mix for firms (Bakare, 2011).

McKinnon (1973); Shaw (1973); Fry (1982) argued that financial deepening as a result of interest rate deregulation directly influences factor productivity through higher real rates of interest. According to them, there is the portfolio choice that diverts savings from low-yielding, self-financed investments to the acquisition of financial assets, through higher yields. The importance of interest rate to manufacturing subsector is best discussed in terms of the provision of capital it commands in the finance of manufacturing sub- sector in Nigeria. Also, McKinnon (1973) and Shaw (1973) emphasized the importance of internal and external finances in the development of manufacturing sub-sector in developing countries, including Nigeria, while McKinnon emphasizes the significance of internal finance where investors have to accumulate savings before obtaining lumpier capital goods; Shaw stresses the importance of external finance and the development of financial institutions in capital accumulation.

Penrose (1963) emphasized on role of capital in the manufacturing sector in explaining the growth of small firm raised the issues of capital and entrepreneurial ability. In his own view, the ability of a small firm to grow by raising capital depends on its entrepreneurial ability. He has this to say: “many small firms without adequate initial financial resources do succeed, do raise capital,

and do grow into large firms. And they do this, for the most part, by virtue of a special entrepreneurial ability. The type of entrepreneurial service needed to raise capital, according to him, may not be closely related to the type of services needed to run a firm efficiently, for successful raising of capital depend on an entrepreneur's ability to create confidence. According to him, raising capital is embedded in entrepreneurial ability. If a firm has entrepreneurial ability to create confidence on the part of financial institutions, it will not be difficult to raise capital. However, this is not the case with most manufacturing firms in Nigeria where potential lenders have little or no knowledge about the managerial capabilities of such enterprises. Patterson and Raja (1992) observe that small enterprises (in Nigeria) are most likely to face credit rationing because most potential lenders have little information on the managerial capabilities or investment opportunities of such firms and are unlikely to be able to screen out poor credit risks, or to have control over borrowers' investment.

Schatz (1964) saw the importance of capital in different perspective. He raised the issue of capital shortage in the finance of manufacturing sub-sector in Nigeria. Most of the Nigeria Businessmen believe that inadequate capital is their main business handicap. Schatz refuted this idea and revealed that what really existed in Nigeria was the shortage of viable projects and not that of capital. He provided empirical evidence using loans operations of the Federal Loans Board (FLB), which gave loans only to firms that had been well established. He introduced the concept of effective demand (for capital) where he mentioned that 'those with projects which the potential lenders adjudged unworthy have a desire but not an effective demand for capital'. In his analysis he showed that "the large false demand for capital creates the illusion that there is a shortage of capital. But the record indicates that true situation is the converse of capital shortage. Instead of a large number of viable projects vainly seeking capital, the situation has been one of capital vainly seeking viable private project. He concluded by generalizing the thesis and applying it to country (Nigeria) as a whole by saying that the prevalence of a false demand for capital throughout the entire country is virtually beyond dispute.

However, Diaku (1972) pointed out that the problem facing manufacturing industries in Nigeria is that of shortage of capital and not "capital vainly seeking viable private projects" as demonstrated by Schatz. He gave four assumptions under which Schatz's thesis could hold and he showed that all the assumptions could not be upheld. He developed another concept of effective demand and in the conclusion of his analysis he said: "we must discard the thesis (Schatz' thesis), as providing no satisfactory operational foundation for either evaluating the capital situation in Nigeria or in any

other developing country. At best it is an appealing but misleading empirical hypothesis which, by the logic of the author's methodology, is incapable of proof."

Empirically, a number of studies have examined the potential of the manufacturing sector in relation to the growth of the economy. Solow (1956) using the growth accounting model in Hong Kong, Korea, Singapore and Taiwan (Four Asian Tigers) found that capital accumulation and the increase in the labour force participation rate had a relatively minor effect, whereas technological progress instead accounted for most of the growth in output per capita. Further studies have reconfirmed the validity of these conclusions. This shows that the economies of the "four tigers" have succeeded because they have learned to use technology faster and more efficiently in their manufacturing sectors than their competitors.

Similarly, a study by Kim and Lau (1994), comparing manufacturing as a source of economic growth in Germany, France, Japan, the United States of America and the United Kingdom vis-à-vis the Four Asian Tigers showed that the most important source of economic growth in the four Asian Tigers was capital accumulation, accounting for between 48 and 72 percent of their economic growth. This was in contrast to the group of the five industrialized countries, in which technical progress has played the most important role, accounting for between 46 and 71 percent of their economic growth.

Ageel et al (2001) ran a co-integration test on energy and its relationship with economic growth in Pakistan, a developing nation like Nigeria and found that increase in electricity consumption leads to economic growth. Ayodele (2004) re-echoed that electricity consumption is positively related to economic growth and that it is the nucleus of operations and subsequently the engine of growth for the manufacturing sector. He concluded by saying that electricity consumption has a diverse impact on the range of socio-economic activities and consequently the living standards of Nigerians. Also, Ayanwale (2002) in his study of human capital development in Nigeria posits that the level of available human capital is low and there is need for more emphasis on training to enhance its potential to contribute to economic development.

Elhiraika (2008) in his empirical study investigated the role of structural dynamics and transformation in the form of manufacturing share in aggregate output. He used data from 36 African countries and also examined the key determinants of manufacturing share in aggregate output and its relationship with real GDP growth and growth volatility. The analysis indicated that an increased share of manufacturing in total output has the potential to raise GDP growth and reduce growth volatility through accelerated growth given the strong backward and forward linkages

between the manufacturing sector and other sectors. The design and implementation of effective industrial policies to promote manufacturing can act as a means to boost economic transformation and achieve economic and social development goals including employment creation and poverty reduction.

However, in Nigeria, the role of institution and other macroeconomic variables in development of the Nigerian manufacturing sub-sector has not been fully addressed and impact has not been fully felt, hence the work of Adebisi and Babatope (2004). The study empirically reveals that apart from institutions other macroeconomic variables affect the manufacturing-sub-sector performance in Nigeria, using Augmented Dickey Fuller (ADF) test and error correction mechanism (ECM) model. Adebisi and Babatope (2004) used the cointegration technique in analyzing interest rate policy and the financing of the manufacturing sub sector. Their analysis however suggests cointegration or an acceptance of the alternative hypothesis among the variables CMS (Credit Manufacturing Sub-sector), ER (Exchange Rate), IMP (Index of Manufacturing Production), INF (Inflation), IRS (Interest Rate Spread) and DGF (Deficit Government Financing).

This study however adopts the method used by Adebisi and Babatope (2004), but this analysis is unique in the sense that instead of interest rate spread (IRS), prime/nominal lending interest rate was used, because it reflects a better picture of true cost of funds, more also most borrowings by manufacturing sub-sector is based on prime/nominal lending rate. Also, instead of the rate of inflation (INF) this model adopts the Consumer Price Index (CPI), because CPI has performed better overtime in similar studies with regression analysis and it generally reflects the true picture of consumers demand visa-vis the general price level. In summary, the evidence from both the theoretical and empirical literature emphasizes technological advancement as being an important factor in the growth of the manufacturing sector and by extension, the Nigeria Economy. Accumulation of capital and the increase in labour productivity can only go so far without the input of technology.

3. Estimation Strategy

The estimation technique consists of three steps procedures. The first step is the unit root test which involves the determination of the order of integration, using the Augmented Dickey-Fuller (ADF) test statistics for unit root (Dickey & Fuller, 1979). The second is the impact estimation, using Least Squares regression method (including a constant term) is run over the sample period 1980-2011 and finally, testing for Vector Error Correction. I test whether the variables are cointegrated over the sample period and if so, what the cointegrating relation is. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is

corrected gradually through a series of partial short-run adjustments Granger and Engle (1987). Haven proved that co-integration is a sufficient condition for an ECM formulation, if variables are non-stationary at level, but cointegrated, their dynamic relationships will be specified correctly by an error correction model. These tests are to enable the us present a precise explanation regarding the relationship the dependent variables, namely; manufacturing sector productivity (MAP) and the independent variables, include Exchange Rate (EXR), Consumer Price Index (CPI), Interest Rate (INT), Credit to the Manufacturing Sector(CMS), Broad Money Supply (M2) and Foreign Direct Investment (FDI). The data set for this paper consists of annual time series from 1980 – 2011 and they were obtained from Central Bank of Nigeria (CBN, 2010 and 2011).

I employ the Standard ordinary least squares regression models (OLS), which better explains an impact model. This choice of the estimation technique is as a result of the fact that Least Squares model best captures the relationship between MAP and its determinants variables.

The general form of the standard regression may be written as is given by the following equation as

$$y = X\alpha + \varepsilon \quad (1)$$

Where y is a T - dimensional vector containing observations on the dependent variable, X is a $T \times k$ matrix of independent variables, α is a k -vector of coefficients, and ε is a T -vector of disturbances. T is the number of observations and is the number of right hand side regressors. Therefore, the stochastic equation in its empirical forms is specified as follow:

$$\text{LogMAP}_t = \alpha_0 + \sum_{j=1}^n \alpha_1 \text{EXR}_t + \sum_{j=1}^n \alpha_2 \text{CPI}_t + \sum_{j=1}^n \alpha_3 \text{INT}_t + \sum_{j=1}^n \alpha_4 \log \text{CMS}_t + \sum_{j=1}^n \alpha_5 \log \text{M2}_t + \sum_{j=1}^n \alpha_6 \log \text{FDI}_t + U_t \quad (2)$$

Equation (2) is designed to measure the relationship that exists between Manufacturing Production (MAP) and its independent variables. This is to see how those explanatory variables influence the MAP of the economy. The expected signs are: $\alpha_1 < 0$; $\alpha_2 < 0$; $\alpha_3 < 0$; $\alpha_4 > 0$; $\alpha_5 > 0$; $\alpha_6 > 0$. The above sign ($\alpha > 0$) implies a positive relationship between IMP and the coefficients of the independent variables, while sign ($\alpha < 0$) indicate negative relationship. There are different indicators to measure the performance of manufacturing sub sector.

These include; index of manufacturing production, contribution of manufacturing sector to gross domestic products, employment in the manufacturing sub-sector, capacity utilization in the manufacturing sub-sector and manufacturing value added. This study takes the manufacturing

production (MAP) as the dependent variable because, changes in the manufacturing sub-sector arising from monetary and macroeconomics policies can be easily observed in this variable. These variables are essential for the following reasons. In Nigeria, the productivity of manufacturing sector has been hindered by high interest rates, particularly the interest rate spread. Interest rate spread is the difference between lending and borrowing rate, it is alleged that this rate is partly responsible for high cost of production in the Nigeria manufacturing sub sector (Adebiyi, 2001).

Economic theory states that when there is an increase in money stocks people have excess money balances, they used the money balance to buy financial assets with the view that the prices of such financial assets will rise. Such a rise in the price of bonds is equivalent to a fall in the rate of interest and this will lead to a rise in investment and increase in the industrial production and GDP hence a good or bad performance of the economic reform programme. Monetary policy is an important investment in bringing about a proper adjustment between the demand for and supply of money. An imbalance between the demands for and the supply of money will be reflected in the price level. A shortage of money supply will inhibit growth, while an excess of it will lead to inflation. As the economy develops, the demand for money is likely to go up due to gradual economic reforms such as the monetization of the non-monetized sector, the increase in industrial production (IP) and the level of investment, as well as the growth of the agricultural sector.

4. Empirical Results

To ensure stationarity of the data I employed the group unit root test of the individual root, of the Augmented Dickey-Fuller (ADF) unit root test. This test is to detect the order of integration of the variables before estimation. The unit root test is necessary because research has shown that non-stationary data leads to spurious regression, which may affect in determining the cointegration relation in the long run. The summary of the results of the tests are presented in Table 1 below

From the ADF test statistics, the results in Table 1 show that LOGMAP, EXR, CPI, INT, LOGCMS LOGM2, and LOGFDI were integrated at order one, that is I(1) or they were stationary at first difference. Comparing the variables levels with their first difference (the ADF unit root test statistic) and various probabilities, the test statistics show that the variables are integrated at order of one. All the variables were statistically significant at 1%, 5% and 10% critical values in first difference

The summary of the results in Table 2 shows an existence of unit root. This implies that all the series are non-stationary at levels except. Therefore the null hypothesis ($\rho = 1$) is accepted at levels

and the null hypothesis ($\rho = 1$) that the series are non-stationary after the first and second difference is rejected for all the series. For the random walk above, there are unit roots, so it is an I(1) series. We therefore concluded that the series are of order one I(1). These are MacKinnon critical values for the rejection of hypothesis of a unit root. Next we look for the short-term linear relationship using the Least Squares method and possible existence of a long run relationship among the variables.

Restating the aprior expectations of our model in equation (2) which indicated negative relationships between MAP and EXR, CPI and INT and positive relationships between MAP and CMS, M2 and FDI, and a look at the estimated regression result in Table 2 below indicates a perfect conformity of the result with the postulated theory. The result show that manufacturing sector productivity (MAP) is negatively related to EXR and CPI and INT and positively related to CMS, M2 and FDI, given the coefficients of determinations which are fully in line with our apriori expectation.

Table 1: Summary of Results of Unit Root Tests

Null Hypothesis: Unit root (individual unit root process)					
Sample: 1975 2011					
Series: LOGMAP, EXR, CPI, INT, LOGCMS, LOGM2, LOGFDI					
Method			Statistic	Prob.**	
ADF - Fisher Chi-square			105.814	0.0000	
ADF - Choi Z-stat			-8.21844	0.0000	
** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality					
Intermediate ADF test results D(UNTITLED)					
Series	Prob.	Order of integration	ADF T-Stat	Max Lag	Obs
D(LOGMAP)	0.0020	I(1)	-4.828876	1	34
D(EXR)	0.0003	I(1)	-5.629380	1	34
D(CPI)	0.0005	I(1)	-3.732526	1	34
D(INT)	0.0000	I(1)	-6.891035	1	33
D(LOGCMS)	0.0045	I(1)	-4.576206	1	34
D(LOGM2)	0.0051	I(1)	-4.529289	1	34
D(LOGFDI)	0.0000	I(1)	-7.914980	1	34

Test critical values:	1% level	-4.252879
	5% level	-3.548490
	10% level	-3.207094

Source: Author's Computation

Table 2: Summary of Estimated Results (Static Impact)

Variable	Coefficient		Std. Error	t-Statistic	Prob.
C	α_0	1.124754	0.820604	1.370641	0.1810
EXR	α_1	-0.000858	0.001422	-0.603697	0.5507
CPI	α_2	-0.010346	0.004364	-2.370926	0.0246
INT	α_3	-0.011443	0.007570	-1.511664	0.1414
LOGCMS	α_4	0.792237	0.183602	4.314958	0.0002
LOGM2	α_5	0.064322	0.224403	0.286635	0.7764
LOGFDI	α_6	0.118544	0.045960	2.579305	0.0152
R-squared	0.994964				
Adjusted R-squared	0.993923				
Durbin-Watson stat	1.176645				
Breusch-Godfrey Serial Correlation LM Test:	1.974059				
F-statistic	955.0155				
Prob(F-statistic)	0.000000		SE $\alpha_0 > SE\alpha_{1-6}$		

Source: Author's Computation

Furthermore, an examination of the results shows a good fit in terms of statistical significance of the explanatory variables and in terms of the standard error of the parameters (Std $\alpha_0 > Std\alpha_{1-6}$), which indicates a non-negative constant term for manufacturing productivity(1.12%) no matter the changes in the selected macroeconomic factors (the independent variables).

From the estimated result, it is obviously that if Exchange Rate (EXR), Consumer Price Index (CPI) and Interest Rate (INT), increase by one percent, manufacturing productivity (MAP) level will decrease by 0.0009%, 0.010% and 0.011% respectively, given the explanatory variable coefficient of determination. From the result it also show that if Credit to the Manufacturing Sector(CMS), Broad Money Supply (M2) and Foreign Direct Investment (FDI) increase by one percent, manufacturing productivity (MAP) will increase by 0.792%, 0.064%, and 0.119%

respectively, respectively, given their coefficient of determinations. The result shows that Credit to the Manufacturing Sector (CMS) and Foreign Direct Investment (FDI) are the most important variables in determining manufacturing productivity in short run in Nigeria. FDI reveals that liberalization of the Nigerian economy has promoted manufacturing growth between 1975 and 2011. It implies that their significances will be much felt, while M2 is less significances

The t-statistic, which is computed as the ratio of an estimated coefficient to its standard error, is used to test the hypothesis that a coefficient is equal to zero. To test our hypothesis we used the probability (p-value) of observing the t-statistic given that the coefficient is equal to zero. For this study we are performing the test at the 1% and 5% significance level, that is, a p-value that ranges between 0.01 - 0.05 are taken as evidence to reject the null hypothesis of a zero coefficient ($H_0: \alpha = 0$) and accept the alternative (H_1) ($H_1: \alpha \neq 0$).

From the result in model, the t-statistic probability values for constant term and LOGCMS and LOGFDI have a range between of 0.000 to 0.015 (0% and 0.02%) and their t-statistic greater than 2. The low probabilities values strongly rejected null hypotheses that indicate that these variables are not significantly in explaining MAP. Thus, we therefore accept the alternative (H_1) for CMS and FDI. In other words their parameters are significantly different from zero ($H_1: \alpha \neq 0$) and the constant term and CMS and FDI are positively significant in explaining MAP, while we equal accept the alternative (H_1) for CPI. In other words its parameter are significantly different from zero ($H_1: \alpha \neq 0$) and the constant term and CPI is negatively significant with a probability value of 2%.

Also, from the result in model, the t-statistic probability value for M2 is 78% approximately. The high probabilities values strongly accept the null hypotheses and indicate that this variable though positively related to MAP but not significantly in explaining MAP. Thus, we therefore accept the alternative (H_0). In other words this parameter is not significantly different from zero ($H_0: \alpha = 0$). It implies that it impact on the manufacturing productions is not significant looking at their explanatory variable coefficient of determination. We also accept the null hypothesis (H_0) of a zero coefficient for EXR and INT with their probabilities value 0.14 and 0.55 (14% and 55%) respectively. In other words the parameter is not significantly different from zero ($H_0: \alpha = 0$). It also implies that their impact on the manufacturing productions is not significant looking at their explanatory variable coefficient of determination.

The coefficient of determination (R^2) show that only 99% of variations in manufacturing productivity (MAP) are accounted for by the changes in Exchange Rate (EXR), Consumer Price Index (CPI), Interest Rate (INT), Credit to the Manufacturing Sector(CMS), Broad Money Supply

(M2) and Foreign Direct Investment (FDI), while the F-Stat is 995.02 with a probability distribution of 0.000% of the F-Stat, it passed the significant test at the 5% as the observed F-Statistic of 995.02 estimated was greater than 4.458 (critical) at that level of significance. It implies that or the result tends to suggest that the regression equation and the overall fitness are not too good.

The Durbin-Watson (DW) test statistic (d^*) and Breusch-Godfrey LM second order test (see appendix 2) for autocorrelation the shows the presence of weak serial correlation between the error terms. From the result d^* is less than 2, that is $1.1766 < 2$ and $1.9741 < 2$, for both DW and BG test respectively, therefore reject the null hypothesis (H_0), which says that there is no positive autocorrelation of the errors' terms; we accept the alternative hypothesis (H_1), which says that there is weak positive autocorrelation of the errors' terms.

Error Correction Model and Long Run Behaviour of the Model

A vector error correction (VEC) model is a restricted VAR designed for use with non-stationary series that are known to be cointegrated. The VEC has co-integration relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The co-integration term for a single model is known as the "error correction term" since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

Since the variables are non-stationary at levels but cointegrated, then their dynamic relationships must be specified by an error correction model (ECM) in order to capture both the short-run and long-run relationships. VEC includes both the long run and ECM. The Error Correction for the long run MAP equation is explained below:

$$D(\text{LOGMAP}) = -0.039(\text{LOGMAP}(-1) - 0.0085\text{EXR}(-1) + 0.399\text{CPI}(-1) + 0.650\text{INT}(-1) + 6.705\text{LOGCMS}(-1) - 7.222\text{LOGM2}(-1) - 2.758\text{LOGFDI}(-1) + 13.099 \quad (3)$$

This implies that, the adjustment coefficient (ECM) or the speed of adjustment of MAP if deviated from its long run equilibrium is 0.04, while the intercept term still is positively related in the long run (13.10). Also the error correction estimate equation shows that the long run behavior of Exchange Rate (EXR), road Money Supply (M2) and Foreign Direct Investment (FDI) appear to have negative relationship in adjusting to long-run disequilibrium given the ECM value and that the long run behavior of Consumer Price Index (CPI), Interest Rate (INT), Credit to the Manufacturing Sector (CMS) appear to have positively relationship to the adjust to long-run disequilibrium given the ECM value. Since the magnitudes of some coefficients are large, these

variables may statistically significant in the determination of the grow rate of manufacturing production the in long run if it is in disequilibrium.

5. Policy Implications and Recommendation

The deductions that could be made from the empirical findings are predicted on the sizes and magnitude of the slope coefficient. The estimated regression coefficients imply that credit to the manufacturing sector and foreign direct investment has a very huge impact on the level of manufacturing productivity in Nigeria. This shows that loans and advances has the capacity to sharply increase the level of production if only credit lines from banks are left to flow unhindered to the manufacturing concerns and also the study empirically reveals that liberalization of the Nigerian economy has promoted manufacturing growth between 1975 and 2011 as proxied by foreign direct investment.

The quantity of money in circulation symbolized here by M_2 though positively related to manufacturing productivity but has less impact. This maybe as a result of the less increase in the volume of money in hands of both consumers and producers made available by the monetary authorities which causes the demand for manufactured goods to fall. When monetary authorities change the money supply, the macroeconomic system adjusts to bring the demand for money in line with the supply of money. If the money supply is increased while the economy is in recession, the extra money will probably flow into the stock and bond markets, stimulating business. As the economy expands, income grows, and the demand for money grows, catching up with the supply of money and restoring monetary equilibrium. If the money supply is increased while the economy is at full employment, the extra money will cause an increase in the demand for goods relative to supply.

Credit to the manufacturing sector has the potential to increase the level of manufacturing output as long as the demand is targeted towards Nigerian manufactured goods as more money is made available to the industries to produce more. The policy implications is that there are basic structures that must be put in place for Nigerian manufacturing sector to obtain higher productivity, loans and advances has the capacity to sharply increase the level of production if only credit lines.

On the basis of these findings this paper therefore recommends that; government should increase the money supply looking at the insignificance of this factor in short run and open more credit lines from the banks to the industries. They must put in place structures to ensure that funds flow uninhibited from banks to the manufacturing productivity and also reduce interest rate which in itself is a cost to the manufacturers. Although from the correlation analysis, the relationship between interest rate and manufacturing output is negative, this relationship does not augur well

for the potential of the industry in Nigeria as it shows that the impact of interest rate is null on the manufacturing sector.

The establishment of Microfinance Banks (former Community Banks), Small and Medium Industries Equity Investment Scheme (SMIEIS), Small and Medium Enterprises Development Agencies of Nigeria (SMEDAN), Bank of Industry (BOI) should be overhauled for development and improvement in the local production. Also, efforts should be made to achieve a more realistic and stable trade balance through liberalization (through FDI) that will guarantee output growth in the both short and long run.

Finally, if the manufacturing sub sector is to be the “engine of growth” in the economy as proposed by Nigerian policy makers, then these lapses, among others, need to be given serious attention and corrected. For instance there is the need for the government to continue to develop the infrastructural base of the economy to boost the industrial sector and also create “enabling environment” in the area of infrastructures and other rights for manufacturers and industrialists.

6. Conclusions

The broad focus of this paper was to identify, within an empirical framework, the proportionality relationship between manufacturing productivity and some selected macroeconomic factors. I develop a multiple equation model, which focuses explicitly on the manufacturing productivity and macroeconomic factors. I used an econometrics models to regress the impact of these factors on manufacturing productivity, while the results depend on the values of the different parameters of dependent variables.

This paper provided evidence showing that the credit to the manufacturing sector and foreign direct investment are the important factors for determining manufacturing production in Nigeria. From the regression analysis, there exist a high and positive relationship between credit to the manufacturing sector in Nigeria and the level of manufacturing output. Credit to the manufacturing sector in the form of loans and advances also have a positive relationship with the manufacturing output. This shows that increase in these variables will impact directly on the quantity of goods produced as a direct relationship exists between them in the short run and long run. In contrast, the study also show that consumer price index have a negative impact on the manufacturing output as showed in the regression coefficients, an increase in these variables would lead to significant decrease in manufacturing productivity. Also, as expected, exchange rate and interest rate have a negative relationship with the manufacturing output in Nigeria in the short run.

In the long run as predicted and forecasted, the credit to the manufacturing sector remained the highest determinant of manufacturing productivity in the long run in Nigeria, while the monetary factors; the broad money supply and exchange rate would have a negative impact on the sector's output in the long run. The implication of excess money supply is inflation, which can be attributed to an excess of the supply of money relative to the demand. Excess money supply causes the value of money to drop, which manifests itself as higher prices, causing each unit of money to buy less. Higher price levels, however, will eventually increase the demand for money, as money is needed to finance more costly transactions. Inflation reduces the demand for money at first, but when the inflation ceases, the demand for money will level out at higher level than existed before the inflation started. This however needs to be reverse because as the rate of inflation rises, the value of the Naira reduces and this affects the quantity of inputs (raw materials) that can be purchased, wage rate, cost of machinery and also increases the price of the final product, which if it is too high, could push demand from locally produced goods to chapter foreign goods which is not the best for the growth of the manufacturing sector in particular and the whole economy at large.

Finally, the central opinion of this study is that manufacturing sector in Nigeria has been declining over the years and this is now reflecting in the poor rate of growth and development of the nation. The conclusion however, is that the interest rate policy of Nigeria has not been successful as expected, thus there is a need for a review of the Structural Adjusted Programme and all its policies. From the previous arguments in this study and from the empirical results, it is clear that some of the macroeconomic factors interest policy have large positive and large negative impact on the productivity of manufacturing sub sector in Nigeria. The study has therefore brought out in clear terms the reason for the poor performances of manufacturing sub sector in Nigeria. Our interpretation of the result is that improvements in some of these factors would account much for higher productivity in the manufacturing sector. For example, monetary policy can account for moderate change price levels, which can cause the reduction. Monetary policy positively impact is maximal and partially significant when compared to fiscal policy. This shows that expansionary policies are vital for the growth of the manufacturing sector in Nigeria which in turn would lead to economic growth.

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