

The Impact of Selected Macroeconomic Variables on Manufacturing Productivity in Nigeria

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Abstract: This paper evaluates the impact of some selected macroeconomic variables (Domestic Private Investment, Government Capital Expenditure, Exchange Rate, Foreign Direct Investment, Consumer Price Index, Credit to Manufacturing Sector and Prime Lending Rate) on Manufacturing Productivity in Nigeria from 1981 to 2015. In testing for stationarity of the variables using Augmented Dickey-Fuller (ADF) and testing for co-integration indicated that the selected variables are co-integrated. Thus, there exist a long run relationship between them. Employing the Ordinary Least Square method of analysis and the annual time series data, the study observed that, exchange rate, and government capital expenditure has negative impact on manufacturing productivity, while prime lending rate, domestic private investment, consumer price index, credit to manufacturing sector and foreign direct investment has positive impact on Manufacturing productivity. The study therefore recommends that the government should create a “stable environment” to encourage the kind of Foreign Direct Investment that will be beneficial to the manufacturing sector. For efficient performance in the Manufacturing Sector, medium and long term loans with low interest rate should be provided as well as make policy that can reduce exchange rate and inflation. Also, the government should increase its expenditure on capital goods to help improve productivity in the manufacturing sector.

Keywords: Macroeconomic Variables, Manufacturing Productivity, Capital Expenditure, exchange rate, foreign direct investment, consumer price index.

1. THEORETICAL BACKGROUND

Sustainable economic growth is a vital aspect of every economy. It has been argued and verified that the manufacturing sector of an economy drives economic growth. The manufacturing sector not only plays an important role but also represents an important criterion in assessing a nation's growth and development. The growth rate of manufacturing sector in a country truly reflects its economic potentiality. Growth in manufacturing sector has significant positive effects on creating employment opportunities, achieving a sustained increase in per capita income, technological innovation and adoption, competitiveness and economic growth of any country. Most developed countries have strong manufacturing base. Most countries that are major players in the global economy transformed the structures of their economies by developing a strong manufacturing sector.

Manufacturing sector refers to those industries which are involved in the manufacturing and processing of items and indulge or give free rein in either the creation of new commodities or in value addition (Adebayo, 2011). According to Dickson (2010), manufacturing sector accounts for a significant share of the industrial sector in developed countries. The final product can either serve as finished goods for sale to customers or as intermediate goods used in the production process. Thus, manufacturing industries are the key variables in an economy and motivates conversion of raw materials into finished goods. In the work of Charles (2012), it is posited that the manufacturing industries create employment which helps to boost agriculture and diversify the economy on the process of helping the nation to increase its foreign exchange earnings.

It has been argued that the fastest trend through which a nation can achieve sustainable economic growth and development is neither by the level of its endowed resources nor that of its vast human resources but technological innovation, enterprise development and industrial capacity as noted by Olamide, Oyebisi, and Olabode, (2014). For instance, Germany despite their poor natural resources and the hurdle they faced from 1920s chronic inflation, they have effectively exploited their manufacturing sector and rose up to become the largest economy in Europe and the fourth largest economy in the world. Similarly, the development of some Asian countries as from the second half of the 20th century was anchored on a virile manufacturing sector. Though the services sector in Nigeria has brought faster economic success, still the manufacturing sector plays an important role on the ground of sustainability. In Nigeria today, though the manufacturing sector is growing at a faster pace, still it has failed to a large extent with regards to its percentage share in the total GDP all because of the challenges in that sector. In the decades since independence, the Nigerian manufacturing sector has witnessed ups and downs as its contribution to GDP rose and fell. In 1970, it had risen to 9.4 per cent of GDP. During the oil boom in 1973, it fell to 7 per cent, but rose to 13 per cent in 1980 at the height of the second oil boom. However, according to the National Bureau of Statistics, manufacturing only contributed 4.1 per cent of Nigeria's GDP in 2010. In other words, in spite of tens of billions of dollars in public and private investments since independence, the manufacturing sector actually contributes less to Nigeria's economy than it did before independence over fifty years ago.

Nigeria has suffered from a grave neglect of the manufacturing sector owing to overdependence on oil. After the discovery of crude oil in Nigeria in the late 1950s, the nation has shifted from its preminent developing industrial production base and placed heavy weight on crude oil production as observed by Englama, Duke, Ogunleye and Ismail (2010). Not only has this jeopardized the economic activities but also aggravated the nation's level of unemployment. Nigeria is faced with wide spread poverty, low standard of living, rising unemployment and dwindling GDP as a result of its mono-economic practice and drastic neglect of other sectors of the economy such as agriculture, tourism, mining and manufacturing sector. This has also eventually made the country monolithic unlike the historical experiences of Britain, US, Germany, Japan, Russia and of late, emerging economies from Asia, notably China, India, Singapore, Taiwan, Thailand, South Korea, Malaysia, Brazil and even recently, Ghana (Obidigbo, 2012). In the 1960s and 1970s Nigeria was said to be on a path to industrialization (Central Bank of Nigeria (CBN) in its annual reports -various editions). It was observed however that as from the 1980s manufacturing firms in Nigeria experienced relative stagnation as the sectors value added per capital lagged behind that of many comparable countries. Presently, the manufacturing sector is experiencing collapse with an average capacity utilization hovering around 40 percent. The Manufacturers Association of Nigeria (MAN) in a survey carried out as part of its membership operational audit in January 2010, recorded that a total of 839 manufacturing firms out of the 2780 registered members closed their factories in 2009. This is due to their inability to cope with the challenges posed by the harsh operating environment in Nigeria. In Nigeria like most developing countries, poor access to production funds has been blamed for the near-absence of growth of the manufacturing sector. Adelegan, (2011) opined that managers of firms complain that inadequate finance and high interest rates are major constraints to doing business in Nigeria. Supporting the same frame of thought, a study by the Federal Republic of Nigeria (2011) held that the flow and quality of bank funding to the private sector went down increasingly as the risk aversion of banks increased in the aftermath of the financial meltdown. Funding has made it difficult for firms to invest in modern machines, information and communication technology and human resources development which are essential factors in trimming down costs, raising productivity and improving competitive strength. Even when credit is available, high lending rate which is sometimes go over 30%, make such credits unattractive, given the fact that returns on investments in the sub-sector have been below ten percent (10%) on the average (Nwasilike, 2006).

Over the past five decades, manufacturing productivity has played important role in the transformation of many low income countries to middle income countries, such countries include Brazil, Hong Kong, India, Malaysia, Mexico, Singapore and South Korea. Anyanwu (2004) and Alao (2010) posited that enhancing productivity should be the focus because several countries that have found themselves in such dilemma have resolved them through productivity enhancement schemes for example; Japan after the end of the World War II and United States of America from the 1970s have ensured that high productivity is the main focus of their economic planning and this have brought about impressive results. However, the capital intensiveness of manufacturing sector as a result of induced technological advancement has caused changes in the macroeconomic policy to become highly significant within the productivity sector, the sector is more vulnerable to variations or changes in macroeconomic variables, such as: interest rates, exchange rates, the size of gross domestic product, foreign direct investment, etc. The manufacturing is faced with a lot of challenges in accessing

credit from banks, which have effect on the importation of raw materials. Other challenges include the poor supply of electricity and continuous rise in the pump price of diesel used mostly in the provision of electricity (CBN, 2009). These lead to high cost of production. In addition, high cost of foreign exchange, high interest rate, poor demand, insufficient raw material supply, inadequate working capital and frequent machine break down, lead to high cost of production. These factors together with inadequate finance heightened low capacity utilization.

Against this background, the main aim of this research work is to empirically investigate the impact of selected macroeconomic variables [Prime lending rate (IR), exchange rate (ER), foreign direct investment (FDI), domestic private investment (INV), government capital spending (GS), credit to manufacturing sector (CMS) and consumer price index (CPI)] on manufacturing productivity in Nigeria.

Prior to and after independence, Nigeria has come up with ways, strategies and developmental plans to establish and ensure functional industries with the intention to increase productivity and economic growth. Osuka (2006) noted that the initiative of the Secretary of State for the Colonies in 1944 gave rise to the Ten-year Plan for Development and Welfare which became operational in 1946 but was thwarted by the introduction of Federal System of Government in October, 1954. After independence, various plans aimed at changing the trend of the economy, specifically the industrial base were made.

Policy makers in their bid to curtail the decline in manufacturing sector productivity introduced some policy initiatives which included; the economic recovery programme, structural adjustment programme, industrial sector adjustment credit and vision 2020. Despite all these, the needed target was not achieved. Though, it should be stated that the economic liberalization through the introduction of the structural adjustment programme led to comparative strong industrial growth, however this relatively strong growth was not sustained (Anyanwu, 2004). It is worthy to note that as a result of the structural adjustment programme together with trade liberalization policies which it encourages, the economy of Nigeria has been faced with challenges that comprise both external shocks and internal issues. The external forces have to do with phenomenal increase in the foreign capital flows, exchange rate volatility and international transmitted shocks (like commodity price collapse). A good example of this effect is that of the global economic crises of 2007. Whereas, internal structural issues is as a result of slow pace of legal and lack of social security system, industrial restructuring, non-performing assets in the banking sector etc.

However, irrespective of all the strategies used by the government of Nigeria to revive and strengthen the manufacturing sector in Nigeria, the results have been futile. There is rather a reduction in the sector employment and this can be attributed to the capital intensive methods it favours. This situation can be backed up with the opinion of Momoh (2012) when he stated that “the capital intensive structure of these industries is anchored on the labour saving obtained by replacing the technology of their parent firm in metropolitan nations substituting plants. The potentials and opportunities for Small and medium scale enterprises 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”.

Besides, recently, Nigeria came up with different incentives and policy measures to support the industrial sector. Igwemma and Nwoko (2007) pointed out that in order to help industrialists obtain cheap funds for investment, the government provided credit facilities on concessionary terms through Development Banks, and the provision of equity funds and long term loans by the banking sector for the encouragement of small and medium enterprises. Other fiscal incentives were also provided. Given the varieties of incentives, strategies and plans to improve industries in Nigeria, one wonders why manufacturing sector contribution to GDP is not only very low but has been fluctuating. This situation can actually be attributed to many factors. One of the reasons Nigeria is experiencing high level of unemployment is due to industrial deficiency, policy inconsistency and crisis which in different ways affect both existing and prospective investors (Anyanwu, 2004).

Manufacturing sector contribution to GDP was at its peak totaling 7.832% in 1982; however, since this period, the contribution of manufacturing sector as a total share of economic output in Nigeria generally declined. The manufacturing sector performance has had a mixed performance over the years owing to vulnerability of manufacturing to global economic pressures, coupled with the impacts that policy changes (especially macroeconomic policies) have, which continues to reshape the sector over time. Unfortunately, this was not stable as the sector started experiencing decline due to the increased revenues from the oil prices which brought about recession. This triggered policy attention to turn back to

the manufacturing sector, with production of steel given primary focus. Before this event, the Nigerian Enterprises Promotion Decrees of 1972 and 1977 had changed majority of firm ownership from foreign to Nigerian, therefore discouraging foreign capital inflows. This resulted in very high cost of imported goods and absence of foreign capital and technology, which encouraged domestic production of basic commodities such as soap and salt.

In addition, export and import subsidies which fostered price manipulation heightened the importation of raw materials which further increased the performance of the manufacturing sector. This brought about 7.83% contribution of manufacturing to total economic output in the early 1980. However, the price manipulation discouraged domestic manufacture of inputs investment in infrastructure and human capital. This brought about decline in manufacturing share to total economic output. Import substitution strategy was encouraged in 1987 by the World Bank Structural Adjustment Programmes (SAP) through the imposition of import bans on raw materials. This fostered competitive production of intermediary input by manufacturers, which lead to fewer plant closures. Alongside, the Privatization and Commercialization Act of 1988, encouraged a higher degree of efficiency achieved in manufacturing. From 1986-1988 there was 0.62% increase in the share of manufacturing to economic output Unfortunately, throughout the 1990s, Nigeria went back to relying heavily on the export of oil, which allowed manufacturing to remain in a declining state. Firms lacked export orientation and efficiency, this made competitive companies to relocate factories abroad. However, a few key industries such as beverages, textiles, cement and tobacco kept the sector afloat, but even these operated at under half of their capacity.

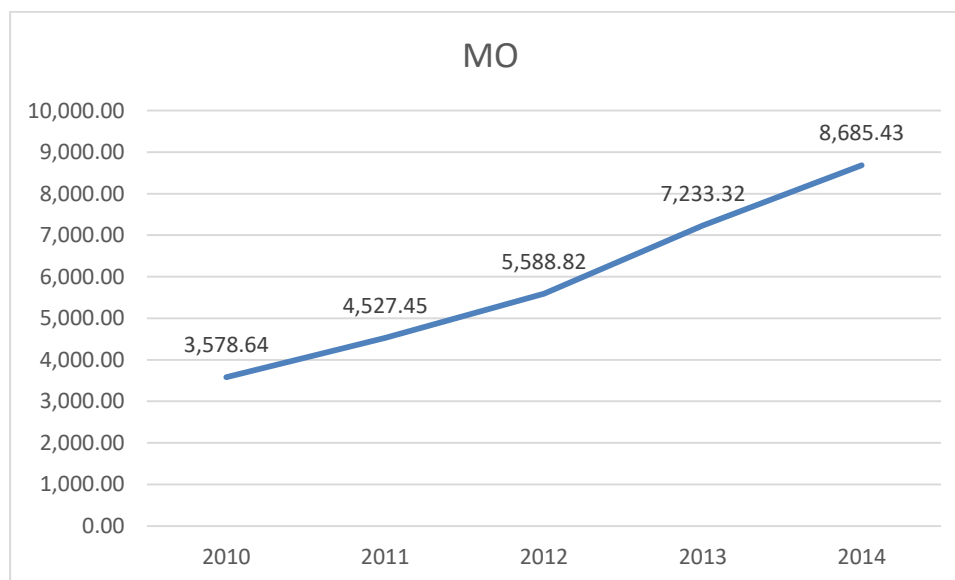


Figure 1.1: Manufacturing sector contribution to GDP from 2010-2014

Source: Author's computation CBN data

From 2010 to 2014, manufacturing sector shows a more optimistic picture, as more modern manufacturing activities have been captured, and prices correctly deflated so that they are representative of the price structure in the economy at that time, taking account of inflation. In the year 2010, with a value of #3,578,641.72 million, the Manufacturing sector represented 6.55% of total real GDP. It grew by #948,803.34 million or 26.51% in 2011 to reach #4,527,445.06 million or 7.79% of real GDP and also grew by #1,061,376.64 million or 23.44% in 2012 to reach a value of #5,588,821.69 million or 7.79% of real GDP. However, growth was highest in 2013, at #1,644,500.79 million or 29.42%, so that the contribution of the Manufacturing sector reached #7,233,322.48 million or 9.03% of real GDP, and in 2014 it grew by #1,452,107.55 thus that the value of manufacturing sector contribution to GDP was #8,685,430.026 million, a value that had not been recorded in decades. Part of the reason for the increase in contribution of the manufacturing sector to GDP from 2010-2014 is the better capturing of output. Prior to the time, manufacturing included just three activities - Oil Refining, Cement and Other Manufacturing. Now, the Other Manufacturing Activity has been broken down into 11 different activities, bringing the total for the manufacturing sector to 13.

Industrial sector in Nigeria has been confronted with myriad of problems such as epileptic power supply, bad road network, inconsistent policies and high cost of capital but macroeconomic variables are very important factors in ensuring or monitoring the level of productivity or manufacturing output. The main research question that goes on in the mind is, “what extent do macroeconomic variables such as Prime Lending rate (IR), exchange rate (ER), foreign direct investment (FDI), domestic private investment (INV), government capital expenditure (GCS), consumer price index (CPI) and credit to manufacturing sector (CMS) determine the output of the manufacturing sector in Nigeria?”

Based on the aforementioned scenario, the following research questions were framed:

1. What is the impact of the selected macroeconomic variables on manufacturing productivity in Nigeria?
2. Do the selected macroeconomic variables have a long run impact on manufacturing productivity in Nigeria?

This study has unarguably adds to the body of existing literature on the impact of macroeconomic variables on manufacturing productivity in Nigeria. The Federal Government of Nigeria will find the result of this research useful in making decisions and implementing policies relating to the macroeconomic environment. In particular, The Central Bank of Nigeria can utilize the findings of this study to bring about good monetary policy which will enhance the manufacturing sector's performance.

The focuses on assessing the impact of selected macroeconomic variables on manufacturing productivity in Nigeria from 1981 to 2015. The selected macroeconomic variables used in this study are Prime Lending Rate (IR), Exchange Rate (EXR), Foreign Direct Investment (FDI), Domestic Private Investment (INV), Government Capital Expenditure (GCE), Credit to Manufacturing Sector (CMS) and Consumer Price Index (CPI).

2. RELATED STUDIES

Nwanne (2015) carried out a study on the implications of government capital expenditure on the manufacturing sector in Nigeria from 1990-2012 using quantitative time series data and multiple regression techniques in the analysis. The result of the co-integration test indicates long run relationship between Manufacturing sector output, total road infrastructural capital expenditure, total health sector capital expenditure and total capital expenditure on telecommunication. It also revealed that capital expenditure on road infrastructure and telecommunication affects the manufacturing sector output in Nigeria significantly while government capital expenditure on power has insignificant effect on manufacturing sector in Nigeria. The implication of this is that manufacturing sector output is clearly affected by factors both exogenous and endogenous to the government capital expenditure in Nigeria. Ehinomen, and Oladipo (2012) examined the impact of exchange rate management on the growth of the manufacturing sector in Nigeria. Ordinary Least Square (OLS) multiple regression analysis, using E-view was employed. The study covered the periods of 1986-2010 with the use of time-series data. The empirical result of the study shows that depreciation which forms part of the structural adjustment policy (SAP) 1986, and which dominated the period under review has no significant relationship with the manufacturing's sector productivity. It was found that in Nigeria, exchange rate appreciation has a significant relationship with domestic output. And that exchange rate appreciation will promote growth in the manufacturing sector. It was also ascertained from the estimated regression line that there is a positive relationship between the manufacturing gross domestic product and inflation.

Tomalo, Adebisi and Olawale (2017) investigated the effect of bank lending and economic growth on the manufacturing output in Nigeria. Times series data covering a period of 36 years (1973-2009) were employed and tested with the cointegration and vector error correction model (VECM) techniques. The findings of the study show that manufacturing capacity utilization and bank lending rates significantly affect manufacturing output in Nigeria. Employing co-integration, error correction model and ordinary least square method, Eze and Ogiji (2013) investigated the impact of fiscal policy on the manufacturing sector output in Nigeria. The result revealed that government expenditure significantly affect manufacturing sector output based on the level of its co-efficient and p-value and there is long-run relationship between fiscal policy and manufacturing sector output in Nigeria.

Samson (2013) used vector error correction model and granger causality model to investigate the relationship between government expenditure and economic growth through industrial sector in Nigeria. The study observed that there is significant negative relationship between government spending and industrial sector of the economy. The finding suggests that there should be effective channeling of public funds to productive sectors in Nigeria.

Employing three-stage least square (3SLS) technique and macro-econometric model of simultaneous equations, Onakoya and Somoye (2013) examined the impact of public capital expenditure on economic growth in Nigeria. The study revealed that public capital expenditure contributes positively to economic growth in Nigeria as it promotes the output of oil and infrastructural sectors but it is directly deleterious to the output of manufacturing and agricultural sector.

Ayashagba and Abachi (2000) carried empirical investigation on the effects of foreign direct investment on economic growth in Nigeria from 1980 to 1997. The result showed that foreign direct investment had significant impact on economic growth in Nigeria. However, the study concludes that the presence of foreign direct investment in the LDCs particularly in Nigeria is not totally useful. Examining the impacts of foreign direct investment in oil sector in Nigeria and its attendant impact on economic growth, Salami (2012) used co-integration analysis to show that foreign direct investment at current year is negatively associated with GDP possibly due to the fact that such investment needed to be allowed some time lag to translate to any significant impact. The impact of domestic capital formation is relatively small compared with the impact of foreign direct investment in the oil sector. Investigating on the relationship between foreign direct investment and economic growth in Nigeria between 1970 and 2008 Umoh, Jacob, and Chuku (2012) argued that there is a bi-directional relationship between FDI and economic growth in Nigeria. The paper then adopted both single and simultaneous equation systems to examine if there is any sort of feed-back relationship between FDI and economic growth in Nigeria. The results show that FDI and economic growth are jointly determined in Nigeria and there is positive feedback from FDI to growth and from growth to FDI.

Adebiyii and Babatope (2004) used the cointegration technique in analyzing interest rate policy and the financing of the manufacturing sub sector in Nigeria. 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).

Nto and Mbanasor (2011) in a study on “productivity in agribusiness firms and its determinants in Abia State, Nigeria”, observed that the major determinants of productivity are skilled labour and raw materials. While skilled labour exerted positive influence on productivity with coefficient of 0.823, cost of raw materials negatively influenced productivity among agribusiness firms in the area. Nto and mbanasor (2011) examined the determinants of productivity among manufacturing firms in South-Eastern Nigeria. The study employed the Cobb-Douglas Production Function in the analysis of the data. The study revealed that the major determinants of productivity are amount spent on unskilled labour (+), cost of raw material (+) and net productivity asset (+) with all exhibiting expected positive influence on productivity at 1% probability level respectively.

Ogar et al. (2014) examined how commercial bank credit can influence manufacturing sector in Nigeria using a time series data for a sample period of 1992-2011. The study utilized ordinary least squares multiple regression analysis and discovered that commercial bank credit had a significant relationship on manufacturing sector in Nigeria.

Melissa and Dean (2013) examined the effect of public expenditure productivity on manufacturing sector in USA cities using simple Cobb-Douglas production function model. It was discovered that there is strong positive and statistically significant relationship between private capital and labour productivity.

Bailliu and Jeannine, (2000) used panel data from 40 developing countries from 1975–1995. He specified a model which accounted for potential endogeneity of the explanatory variables and the result showed that capital inflows foster higher economic growth, above and beyond any effects on the investment rate, but only for economies where the banking sector has reached a certain level of development.

Also Cuadros and Alguacil, (2001) examined the nature of the causal relationship between output level, inward foreign direct investment and trade in Latin American countries; Argentina, Brazil and Mexico from the middle seventies to 1997. Utilizing a vector auto-regressive (VAR) model the result of the study suggests a significant impact of foreign direct investment on economic growth and trade in the analyzed countries.

Using cross-sectional data relating to a sample of 66 developing counties over three decades, Makki and Somwaru (2004) analyzed the role foreign direct investment and trade in economic growth of developing countries within the endogenous growth-theory framework. The study shows that foreign direct investment and trade contribute toward advancing economic growth in developing countries. The study further believed that sound macroeconomic policies, better stock of human capital and institutional stability are necessary preconditions for foreign direct investment -driven growth to materialize and stimulate domestic growth.

Ndambendia and Njoupouognigni (2010) established that there was a long run association between aid, FDI and economic growth in 36 sub-Saharan Africa countries, and also found that foreign aid and FDI exert positive effect on economic growth, but the effect of aid is lower. Ray (2012) determined the determinants of total factor productivity growth in selected manufacturing industries in India. Using OLS technique, the econometric result suggested that explicit trade variables as well as macro-economic variables have relevant significant impact on total factor productivity growth of those industries. The unmistakable implication for Indian policymakers is the need to open up more to foreign imports, which will help to bring about institutional and technological progress conducive to TFP growth. Anaman and Osei-Amponsab (2009) examined the determinants of the output of the manufacturing industry in Ghana from 1974 to 2006. They employed cointegration and error correction model analysis to establish the determinants. They showed that the level of output of the manufacturing industry was driven in the long-run period by the level of per capita real GDP (+), the export-import ratio (+) and political stability (+). In the short run period the level of output of the manufacturing industry was influenced by the export-import ratio (+) and political stability (+). They suggested that increasing level of manufacturing in Ghana would partly depend on the growth of export – based manufacturing firms.

Akinlo (2006) examined the effects of macroeconomic factors on productivity in 34 sub-Saharan African countries for the period 1980 to 2002. The result showed that external debt, inflation rate, lending rate among others negatively influenced productivity. Human capital, credit to private sector % of GDP, foreign direct investment % of GDP, manufacturing value added as a share of GDP have significant positive influence on productivity.

3. METHODOLOGY

Model specification:

Here the link between the selected macroeconomic variables and manufacturing productivity is shown. The following relationship could be specified between the dependent variable and explanatory variables.

Manufacturing output is a proxy for manufacturing productivity.

Functional form of the model:

The functional form of the model is given based on the research objectives as:

$$MO = F(IR, ER, FDI, INV, GS, CMS, CPI) \text{-----} 3.1$$

Where:

MO = Manufacturing Output (Proxy- Manufacturing Sector contribution to GDP)

IR = Prime Lending Rate

EXR = Exchange Rate

FDI = Foreign Direct Investment

INV= Domestic Private Investment (Proxy- Fixed Gross Capital Formation)

GCE = Government Capital Expenditure

CMS = Credit to Manufacturing Sector

CPI = Consumer price index

The linear form of the model is justified by the use of OLS estimation technique, which determines the responsiveness of parameter estimates to the dependent variables.

Mathematical form of the model:

The mathematical form of the model is given as:

$$MO = \beta_0 + \beta_1 IR + \beta_2 ER + \beta_3 FDI + \beta_4 INV + \beta_5 GS + \beta_6 CMS + \beta_7 CPI \text{-----} 3.2$$

Where:

β_0 = The Intercept term

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ & β_7 = The slopes or parameters of their respective variables

Econometric Form of the Model:

The econometric form of the model is given as:

$$MO = \beta_0 + \beta_1 IR + \beta_2 ER + \beta_3 FDI + \beta_4 INV + \beta_5 GS + \beta_6 CMS + \beta_7 CPI + \mu \text{ -----} 3.3$$

Where:

μ = the random or stochastic error term or white noise

The stochastic error term (μ) is a surrogate for all those variables that are omitted from the model but collectively affect the dependent variable (Gujarati 2012). Put differently, the stochastic error term explains all other macroeconomic variables that affects manufacturing output which are not accounted for by the model.

In the equations above, manufacturing output is the dependent variable while others are the independent variables. Equations (1) to (3) are functional form model, mathematical form model and the econometrics linear form model respectively. The functional form model show that relationship exist between manufacturing output and the explanatory variables, the mathematical form model is an attempt to quantify the rate at which the independent variables explain manufacturing output. But the purely mathematical form model is of limited interest to this research work for it assumes there is an exact or deterministic relationship between manufacturing output and the independent variables, since the relationship between economic variables are generally inexact. Thus the econometrics form model proves useful, by including an error term (μ) to capture other variables that could affect manufacturing output but not included in the model.

4. DATA ANALYSIS AND RESULTS

Unit Root/Stationarity Test Result:

The stationarity test is useful in order to avoid the problem of running a spurious regression. Since we are dealing with time series variables which were generated through a stochastic process, that is, a collection of random variables ordered in time, we have to determine if this stochastic process is stationary. A variable is stationary if the absolute ADF value is greater than any of the absolute Mackinnon tau critical values. The Augmented Dickey fuller ADF test was applied to find the existence of unit root in each of the time series. 5% level of significance is adopted in this research work.

Test of Hypothesis:

H_0 : The variables have unit root

H_1 : The variables do not have unit root

Decision Rule: Reject H_0 , if /ADF statistic/ > /critical value/ at $\alpha = 5\%$, do not reject if otherwise. If the null hypothesis is rejected, it means that the series are stationary or integrated.

Unit Root Test Results:

(Table 4.1)

Variables	ADF Statistics	5% Critical Value	Order Of Integration
MO	-4.467806	-3.552973	I (1)
IR	-4.656668	-3.574244	I (0)
INV	8.237298	-3.580623	I (0)
EXR	-5.268181	-3.5552973	I (1)
FDI	-3.721427	-3.568379	I (0)
CMS	7.586889	-3.587527	I (1)
CPI	-6.339519	-3.557759	I (2)
GCE	-4.622902	-3.595026	I (1)

Source: Researcher's Computation Using E-Views 8.0.

From the table, we observe that prime lending rate, domestic private investment, and foreign direct investment are stationary at level form as their ADF statistic is greater than their 5% critical value at levels. The remaining variables were non-stationary at level form and thus has to be differenced to make them stationary. This is because, according to Gujarati and Porter (2009), if we have ninety-nine stationary variables and one non-stationary variable, the whole model would be non-stationary. At first difference, manufacturing output, exchange rate, credit to manufacturing sector and government capital spending became stationary. Consumer price index was not stationary at first difference, thus, it was further differenced and it became stationary at second difference.

From the results, we reject H_0 and conclude that the variables have unit root or are integrated.

Co-integration test result:

The variables used in this study are integrated of order zero (level form), order one (1st difference) and order two (2nd difference), but we have to check if the linear combination is stationary. Thus, this test checks for the presence of a longrun relationship between the dependent and independent variables. The Johansen co-integration test was used which is comparing the trace statistics and the critical value. 5% level of significance is adopted. According to Tang (2010), the major advantage of using the Johansen and Juselius (1990) Trace test procedure is that it has superior properties in particular for two or more variables in a system, as it is not sensitive to the choice of dependent variables as it assumes all variables endogenous. In addition, the Johansen test is preferred to the Engle and Granger two step procedure as the latter first estimates the regression equation and test for stationarity of the residual, this can bring about the transmission of errors. In addition, the Johansen method shows the number of co-integrating equations as well as the estimation of the long run equation, which is not possible with the Engle and Granger two step procedures (Arize, 2008).

Test of Hypothesis:

$$H_0 : \delta = 0 \text{ (there is no co-integration)}$$

$$H_1: \delta < 0 \text{ (there is co-integration)}$$

Decision Rule: reject H_0 if trace statistics is greater than 5% critical value or if there is asterisks and accept if otherwise.

Johansen Co-Integration Test Result:

(Table 4.2)

No. of Co-integrating Equations	Trace Statistics	5% Critical Value
None*	396.8752	187.4701
At most 1*	233.5992	150.5585
At most 2*	153.3003	117.7082
At most 3*	111.4813	88.80380
At most 4*	73.87959	63.87610
At most 5	42.81270	42.91525
At most 6	21.09476	25.87211
At most 7	3.741560	12.51798

Source: Researcher's Computation Using E-Views 8.0

We have an asterisk where the trace statistic is greater than the critical value. Since we have asterisk in five situations which means that the trace statistic is greater than the 5% critical value, we can say that there are at least five co-integrating equations. This indicates the possibility of rejecting the null hypothesis that says there are no co-integrating vectors at 5% level of significance and accepting the alternate hypothesis which states that there is co-integration. This confirms the existence of long run equilibrium relationship between the variables. Thus the variables will converge in the long run.

Presentation of Ordinary Least Square (Ols) Regression result:**(Table 4.3): Regression Results (Dependent Variable=MO)**

Variables	Coefficient	Std. Error	t-Statistic	Probability
CONSTANT	1193.567	191.2970	6.239338	0.0000
CMS	0.146540	0.069196	2.117752	0.0435
CPI	26.44202	9.648385	2.740564	0.0107
EXR	-6.615043	2.737553	-2.416407	0.0227
FDI	3.00E-08	4.83E-08	0.620823	0.5399
GCE	-0.304670	0.540547	-0.563632	0.5777
INV	1.07E-10	4.74E-11	2.249136	0.0329
IR	13.55685	10.54546	1.285562	0.2095
R ² = 0.97	Durbin Watson = 1.31		F-statistic = 1.34.7840	
Adjusted R ² = 0.96			Probability(F-statistic) = 0.000000	

Source: Researcher's Computation Using E-Views 8.0

Evaluation of ols result based on economic (a priori) criteria:

MO=1193.56707746+0.146540020689*CMS+26.4420192602*CPI-6.61504240871*EXR +3.00080882142e-08*FDI-0.304670045394*GCE+1.06554847934e-10*INV +13.5568501739*IR. From the Ordinary Least Squares result in table 4.3 above, the direct impact of the various macroeconomic variables – Prime lending rate (IR), exchange rate (EXR), foreign direct investment (FDI), domestic private investment (INV), government capital expenditure (GCE), Credit to manufacturing sector (CMS) and consumer price index (CPI) on manufacturing productivity in Nigeria can be analyzed.

Constant Term (C):

The coefficient of the constant in the model is 1193.56707746 with probability of 0.0000. This shows that when the explanatory variables are held constant, ceteris paribus, manufacturing output increases by 1193.56707746 units. The coefficient is positive and statistically significant at 5% level of significance.

Credit to Manufacturing Sector (Cms):

Credit to Manufacturing Sector (CMS) conformed to the positive a priori sign and the probability is 0.0435 which is statistically different from zero at 5% level of significance. The coefficient is 0.146540020689 and implies that a unit increase in the credit to manufacturing sector will on the average lead to 0.146540020689 units increase in the manufacturing sector output, holding other variables constant.

Consumer Price Index (Cpi):

The coefficient of consumer price index (CPI) is positive. This does not conform to theoretical postulation which states that an increase in consumer price index will lead to a decrease in manufacturing output. The implication of this non-conformity is that a unit increase in consumer price index will on the average increase manufacturing output by 26.44202 units, holding other variables constant. This does not make economic sense.

Exchange Rate (Exr):

The coefficient of Exchange rate (EXR) is -6.615043. this conformed to the a priori sign which expects a negative relationship between exchange rate and manufacturing productivity. Thus, this implies that a percentage increase in the exchange rate of the naira to dollar will on the average result in 6.615043 percent decrease in manufacturing productivity. The probability value of exchange rate is less than 0.05 and shows that exchange rate is statistically different from zero at 5% level of significance.

Foreign Direct Investment (Fdi):

The coefficient of foreign direct investment is positive and conforms to the theoretical postulation which states that foreign direct investments undertaken in Nigeria will boost productivity. The implication of this conformity is that manufacturing sector productivity will on the average increase by 3.00080882142e-08 units with a unit increase in foreign direct investment, holding other variables constant. The probability value is 0.5399 which shows that foreign direct investment is not statistically different from zero at 5% level of significance.

Government Capital Expenditure (Gce):

The coefficient of Government capital expenditure is -0.304670. This does not conform to the positive a priori sign which states that an increase in government capital expenditure will increase productivity. The implication of this non-conformity is that a unit increase in government capital expenditure will on the average lead to 0.304670 decrease in manufacturing productivity holding other variables constant. This does not make economic sense. The probability value is 0.5777 which shows that at 5% level of significance, government capital expenditure is not statistically significant.

Domestic Private Investment (Inv):

The domestic private investment is positive and conforms to a priori sign. The coefficient of INV is 1.06554847934e-10 which implies that a unit increase in domestic private investment, holding other variables constant, will on the average lead to 1.06554847934e-10 units increase in manufacturing productivity. The probability value is 0.0329 which implies that at 5% level of significance, domestic private investment is statistically different from zero.

Prime Lending Rate (Ir):

The coefficient of Prime lending rate is positive and does not conform to the negative a priori sign which states that an increase in the prime lending rate will lead to a decrease in productivity. The implication of this non-conformity is that a unit increase in the prime lending rate will on the average lead to 13.55685 increase in manufacturing productivity holding other variables constant. This does not make economic sense because increased prime lending rate discourages firms from getting loan and credit for investment and this results in decreased productivity. The probability value is 0.2095 which shows that at 5% level of significance, government capital expenditure is not statistically significant.

5. SUMMARY AND CONCLUSION

This study investigated the impact of selected macroeconomic variables (Domestic Private Investment, Government Capital Expenditure, Exchange Rate, Foreign Direct Investment, Consumer Price Index, Credit to Manufacturing Sector and Prime Lending Rate) on Manufacturing Productivity in Nigeria. To accomplish this objective, an econometric methodology was adopted as a tool for testing the stated objective. The model was estimated using an annual time series data from 1981 -2015 and the Ordinary Least Squares method was chosen as the estimation tool because of its best linear unbiased estimates.

The result of the unit root test suggested that three of the variables were stationary at level form, four variables were stationary at the first difference and one variable was stationary at second difference. The F-test result further revealed that there exists overall significance of the variables in the model. That is the variables have joint significance. The t-test result showed that the variables are statistically significant except Foreign Direct Investment, Government Capital Expenditure and Prime Lending Rate. The result from the co-integration test reveals an evidence of long-run relationship between the selected macroeconomic variables (interest rate, exchange rate, domestic private investment, consumer price index, government spending and foreign direct investment) and manufacturing productivity in Nigeria from 1981-2015.

This research work revealed the impact of selected macroeconomic variables on manufacturing productivity in Nigeria, from the year 1981-2015. This was carried out with the use of the Ordinary Least Square techniques that focused explicitly on manufacturing productivity and macroeconomic variable selected for this work.

Findings also show that although foreign direct investment exert a positive impact on manufacturing productivity, it is not statistically different from zero. It is the researcher's opinion that foreign investment in Nigeria is relatively small which result to its insignificance. Government capital expenditure has a negative impact on manufacturing productivity. This does not conform to the expected result. The reason for this non-conformity could be that government capital expenditure is small and is not geared towards the manufacturing sector. Consumer price in Nigeria is not a significant determinant of manufacturing sector productivity. The study provided evidence that domestic private investment, exchange rate and credit to manufacturing sector are very important factors for determining manufacturing productivity in Nigeria.

6. POLICY RECOMMENDATIONS AND SUGGESTIONS

Based on the findings of this research work, the following policy recommendations are worth stressing:

1. Fiscal and monetary policy should be reviewed as the study revealed that higher exchange rate is not favourable to manufacturing sectors. Higher exchange rate makes domestic output expensive relative to foreign output. The resultant effect is increased import relative to export and reduced net export which also means low output.

2. Domestic private investment should be increased as it has a significant positive impact on manufacturing productivity. Increase in household income with decrease in consumption and increase in savings and investment will increase productivity as more firms will be established and existing ones will be improved.

3. This study has empirically revealed that Foreign Direct Investment has not really promoted manufacturing productivity within the period under review. Hence, conducive and stable environment should be provided in order to encourage the kinds of Foreign Direct Investment that will be beneficial to the manufacturing sector.

4. The study showed that credit to manufacturing sector is a significant factor affecting manufacturing productivity in Nigeria. High availability of credit to manufacturing sector helps to improve productivity. The government should therefore enhance financial institutions that will provide medium and long term loans and other credit facilities with low interest rate in order to enhance productivity in the manufacturing sector.

Finally, since the manufacturing sub sector is the “engine of growth” in the economy as proposed by Nigerian policy makers shown in this research work, then the above policy recommendations need to be given serious attention.

As stated earlier, this research work will serve as a reference point for further research work. This is because other than the gap filled by the research; there are still exigency gaps, which could not be filled due to the scope and context of this paper. To this end, suggestions made for further research work relating to manufacturing sector productivity in Nigeria are as follows:

1. Econometric analysis of the impact of importation cost on manufacturing productivity.
2. The Impact of Taxation and Fiscal Policy on Manufacturing Output in Nigeria.
3. The Effect of Institutional Policy in Manufacturing Productivity in Rural Areas: A Case Study of Nigeria.
4. Technology Development and Manufacturing Output in Nigeria.

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