The paper focuses on the impact of macroeconomic determinants on industrial productivity in Nigeria for the period, 1981-2013. It was discovered that while the Nigerian government had embarked on a number of industrial development strategies with the sole purpose of boosting industrial productivity in Nigeria, they seem to have yielded little or no result. The macroeconomic variables in the study include industrial production index, exchange rate, consumer price index, interest rate, broad money supply, foreign direct investment, credit to manufacturing sector and gross domestic product. The study employed OLS technique and found that exchange rate exert significant positive impact on industrial productivity in Nigeria. Also, the impact of interest rate, FDI and real GDP on industrial production index is positive. On the other hand, consumer price index, broad money supply and credit to manufacturing sector exert negative impact on industrial development in Nigeria. The paper recommended that a workable M2 that can enhance credit to manufacturing sector and at the same time control interest rate to boost investment should be determined.

**Key words:** Industrial Productivity, Exchange Rate, Stationarity Test, OLS technique

**INTRODUCTION**

Industrial development has for all time constituted a major objective of development strategy and government policy. Through industrial development, developing nations yearn to achieve higher economic growth, and to eventually attain developed nation’s status. Industrial development entails the expansion of the secondary sector in an economy dominated by primary activities. It can be termed as the period of social and economic change that transforms a human group from an agrarian society into an industrial one. It is a part of a wider modernization process, where social change and economic development are closely related with technological innovation, particularly with the development of large-scale energy and metallurgy production. It is the extensive organization of an economy for the purpose of manufacturing. Industrial development can also be seen as an increase in the share of manufacturing sector in the Gross Domestic Product (GDP) and in the occupations of the economically active population. It could at the same time be used to describe the development of economic activity in relatively large units of production, making much use of machinery and other capital assets, with the tasks of labour finely divided and the relationships of employment formalized (Kirk-Greene, 1981). In either case, industrial development is concerned with the expansion of a country’s manufacturing activities, including the generation of electricity and the growth of its communications network. It is also a process of reducing the relative importance of extractive industries and of increasing that of secondary and the tertiary sectors (Adejugbe, 2004).
Industrial development requires adequate and efficient availability of factor inputs such as labour, capital, land, knowledge or technology etc., these factor inputs determines the pace of industrial development in every economy. This drawn our attention to the interdependence between the agricultural sector and the industrial sector in making available labour factor for industrial development. This is evident from the postulation of the Arthur Lewis model of economic development with unlimited supply of labour. Lewis was of the opinion that, the lower the cost of industrial labour, the faster the rate of industrial expansion is likely to be, but this depends on the rate at which the agricultural sector is releasing labour which depend on whether the marginal product of labour in the subsistence sector is equal to or less than the subsistence or institutional wage so that a reduction in the number of workers would not lower the average (subsistence) product of labour and might even raise it. At the same time, capital is also an important factor for industrial development which its availability can also be attributed to the development in agricultural sector. Agricultural sector is also a source of saving and capital accumulation for industrial development. Solow believes that what drives growth is savings since it is the share of output in the investment and therefore, industrial output expansion is a function of capital accumulation. All other factors are directly or indirectly provided by the agricultural sector.

It is important to note at this junction that government is the center player in achieving the desired level of industrial development in the country. Governments are saddled with the responsibility of economic management which is a very crucial role since it involves the management of the macroeconomic variables such as output, aggregate demand, exchange rate, interest rate etc., and these variables determine the growth path of every economy and its development. It therefore implies that, government pursues the objectives of industrial development through the management of macroeconomic variables. Hence, economic management relied on a policy-mix of two complementary tools namely: monetary policy and fiscal policy.

Monetary policy involves the control of money supply and interest rate to achieve the desired objective or goal in the economy. This has impact on the industrial development in the country. If the policy is expansionary i.e reduction of interest rate and increase in money supply is capable of increasing capital formation and thereby lead to industrial development in the economy. Monetary policy manipulates the supply of money and credit in private hands. Monetarism holds that the supply of money is the key to the nation’s economic health. The main agency for making monetary policy is “CBN,” whose formal title is the Board of Governors of the Central Bank of Nigeria. The CBN uses three instruments to control the money supply. First, they set discount rates for the money that banks borrow from the Central Bank. Second, they set reserve requirements that determine the amount of money that banks must keep in reserve at all times. Third, they buy and sell government securities in the market, thereby expanding or contracting the money supply. The amount of money available, interest rates, inflation, and the availability of jobs are all affected by the CBN activities. Presidents try to persuade the CBN to pursue policies in line with the presidential agenda.

Fiscal policy on the other hand, is a policy instrument that relies on public revenue and public expenditure management to produce the desired effect in an economy. It is the government policy with respect to spending and taxing in pursuance of the goals of stabilization, greater equality in income distribution and enhancing the economic well-being of the people (Shapiro, 1996). It is the flow of funds out of the spending and savings streams into the hands of government and the flow of these funds from the government into the private economy. Fiscal policy must become more expansionary. Interest and foreign-exchange rates must be designed to support increased investment and growth in exports. In particular, targets for the Central Bank should include the
current employment and growth targets. That generally requires a reduction in real interest rates to levels comparable or lower than Nigeria’s main trading partners.

Government in pursing of industrial development had adopted various fiscal policy regimes with needs for changing from one fiscal regime to the other. This involved adoptions of series of target variables and fiscal instrument which had led to development of diverse policies, strategies and programmes geared towards industrial development. Such programmes and strategies among others are different economic development policies (with each having a bearing on the industrial sector) were adopted ranging from Import Substitution Strategy (ISS) through indigenization to the Structural Adjustment Program (SAP), export promotion, incentives for local industries, import liberalization, concessional rates on duty on raw material importations, structural adjustment programme etc. Government, in August 1988, also established the national committee on industrial development (NCID). The strategic management of industrial development (SMID) or industrial master plan (IMP) is predicted on the need to organize a network of sectors (referred to as strategic consultative groups) around on industrial activities with the aim of having a comprehensive and keen view of the investment problems in particular line of industrial activity. The (IMP) seeks to minimize the problems of policy and programme consistency in the development of the nations industries.

Hence, it can be deduced without any iota of doubt that, there is significant relationship between industrial development and macroeconomic variables which serve as a channel through which the government manage the economy and achieve her desired objective or goal. Therefore, given the level of industrial development in the country, this study seeks to analyze the macroeconomic determinants of industrial development in Nigeria. Hence, following the above introduction, the remaining part of this paper is set out as follows: Section two presents the review of existing and related literature on the topic, while section three presents the model specification and research estimation procedures. Section four discusses the empirical results of the paper and section five concludes the paper.

LITERATURE REVIEW

Conceptual Issues

Overview of the Nigerian Industrial Sector

The composition of manufacturing production has been a derivative of the various development plans (Alao, 2006). The First National Development Plan (1962-1968) emphasized light industry and assembling activities. The second plan (1970-1975) had a somewhat similar thrust and focus, but the emphasis shifted in the third plan (1975-1980) towards heavy industries. Major projects were initiated in the steel and petroleum refinery sector. For the fourth plan (1980-1985), the broad direction as in consonance with the third: it retained the stress on heavy industries. But several of the pretentious plans were short changed with the onset of the profound economic crisis in the early 1980s. The participants in the Nigerian industrial and manufacturing sector can be grouped into four, namely: (a) Multinational (b) National (c) Regional (d) Local groups. Separately from the multinational operators, most of the other participants have vanished in the last two decades, due to capricious government policies, lack of basic raw materials, most of which are imported (Afaha, J. S. and Ologundudu, M. M., 2014).
The Nigerian Industrial Policy Stages

The development of the Nigerian industrial policy involved through two key stages as concurred by (Alao, 2006). They are as follows:

(a) The first period (1970—1985): The period covers the state-led import substitution industrialization strategy. The main focus is on the economic role of government through direct investments, administration of a protectionist trade regime, and the introduction of schemes such as indigenization and preferential credit to nurture indigenous entrepreneurs. It is argued that the roles assumed by the government, gave it a leadership role in the economy and direct control over the welfare of individual private businesses. The government’s strategy during this period simply involved attracting and encouraging foreign capital to engage in manufacturing activities.

(b) The second period (1986—present): The period lays emphasis on the economic liberalization policies that replaced the state-led import substitution industrialization strategy and nationalization policy. Government’s policy in this period focuses on privatization, deregulation of foreign investments, trade liberalization, deregulation of credit policy and the introduction of the Foreign Exchange Market (FEM). Privatization and deregulation has resulted in the reliance of market, rather than state regulation, and is reducing the role and power of government relative to the private sector.

Empirical Review

Literatures on the relationship between the macro economic variables and industrial development are quite few as most of the literatures reviewed dealt with the relationship between macroeconomic variables and stock market return, stock market index, banking profit or performance etc. However, a small number that has helped us in gaining insight on how to empirically analysis and achieve the objective of this paper are presented as follows;

Afaha and Ologundudu (2014), empirically investigate the macroeconomic factors affecting industrial performance in Nigeria over the period of 1979-2010 by employing the co-integration and an error correction model. Their study revealed that, interest rate spread and exchange rates have negative impact on the growth of manufacturing sub-sector in Nigeria and also show that a rise in the index of manufacturing sub-sector is a reflection of high inflation rate and cannot be interpreted to mean a real growth in the sector. They argued that liberalization of the Nigerian economy has promoted manufacturing growth for the period under study and concluded that, a long-run equilibrium relationship exists amongst the variables, as evidenced by the co-integration. Adebiyi and Babatope (2004), considered the role of institution and other macroeconomic variables in development of the Nigerian manufacturing sub-sector. Their empirical study using Augmented Dickey Fuller (ADF) test and error correction mechanism (Dickey D.A. & Fuller W.A.1979), (ECM) model revealed that apart from institutions other macroeconomic variables affect the manufacturing-sub-sector performance in Nigeria.

Adebiyi 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).
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.

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.

Odior, (2013) empirically investigated the impact of macroeconomic factors on manufacturing productivity in Nigeria over the period 1975-2011. He started his analysis by examining stochastic characteristics of each time series by testing their stationarity using Augmented Dickey Fuller (ADF) test and estimate error correction mechanism model. His result revealed the presence of a long-term equilibrium relationship, as evidenced by the cointegrating equation of the VECM and concludes 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.

Sangosanya (2011) used panel regression analysis model and gibrat’s law of proportionate effect in investigating firm’s growth dynamics in Nigerian manufacturing industry. The study observed that the manufacturing firms finance mix, utilization of assets to generate more sales, abundance of funds reserve and government policies are significant determinants of manufacturing industry growth in Nigeria.

Rina, Tony and Lukytawati (2010) examined the impact of fiscal and monetary policy on industry and growth of economy in Indonesian using the computable general equilibrium (CGE) model. It was found that fiscal and monetary policy have a positive impact on Indonesian macroeconomic performance in terms of change in GDP, investment, consumption and capital rate of return.

Ogbole, Sonny and Isaac (2011) focused on the comparative analysis of the impact of fiscal policy on economic activities in Nigeria during regulation and deregulation, using the econometric methods of co-integration and error correction model. The study indicates that there is a difference in the effectiveness of fiscal policy in stimulating economic growth during and after regulation period. They recommend that government fiscal policy should refocus and redirect government expenditure towards production of goods and services so as to enhance GDP growth.
Dickson (2007) critically examine the recent trends and patterns in Nigeria’s industrial development using descriptive study. The study indicates that the level of manufacturing industry in Nigeria is concentrated in the southern part of the country and that the spatial pattern could change if industrialists adopt the strategy of industrial linkage. This finding did not support any school of thought as it suggests that policy on privatization of industry in Nigeria should be enhanced. Ajayi (2011) in a study of the collapse of Nigeria’s manufacturing sector on economic growth. He used cross-sectional research design and found out that the main cause of collapse in the Nigerian manufacturing sector is low implementation of Nigerian budget especially in area of infrastructure. This means that low implementation of fiscal policy affects the level of growth in Nigerian manufacturing sector.

Rasheed (2010) investigated the productivity in the Nigerian manufacturing subsector using co-integration and an error correction model. The study indicates the presence of a long-run equilibrium relationship index for manufacturing production, determinants of productivity, economic growth, interest rate spread, bank credit to the manufacturing subsector, inflation rates, foreign direct investment, exchange rate and quantity of graduate employment. This finding has research gap on the area of factors that affect manufacturing sector in Nigeria. Hence, with the non availability of previous work that gives a clear cut relationship between the macro economic variables and industrial development, undertaken this research work becomes necessary and imperative.

**MODEL SPECIFICATION AND ESTIMATION PROCEDURES**

From the review of the empirical literature, some of the variables that determine industrial development in Nigeria as employed in this study include index of manufacturing production (IMP), gross domestic product (GDP), interest rate spread (IRS) etc. The above determinants are informed given the nature of activities of the industrial sector in that, it produces goods and services for sale which represents the output of its activities with the aim of making returns on investments. In Nigeria, the performance of industrial sub-sector has been hindered by high interest rates, particularly the interest rate spread (IRS) which is the difference between lending and borrowing rates (Afaha and Ologundudu, 2014). It is assumed that this rate is partly responsible for high cost of production in the Nigerian industrial sub-sector (Adebiyi and Babatope-Obasa, 2004). The study therefore adapts the model used by Odior, (2013). He considered variables such as manufacturing sector productivity (MAP) as the dependent variable and the independent variables, include but not limited to Exchange Rate (EXR), Consumer Price Index (CPI) instead of the rate of inflation (INF) with the conviction that CPI has performed better overtime in similar studies as it generally reflects the true picture of consumers demand visa-vis the general price level, prime or nominal Interest Rate (INT) instead of IRS etc. The uniqueness of this study lies in the use of Industrial Production Index (IPI) as a measure of industrial development by employing sample data for the period, 1980-2013 using the Ordinary Least Squares (OLS) technique. Consequently, the functional relationship between IPI and macroeconomic variables are stated thus;

\[ IPI = f(EXR, CPI, INT, M2, FDI CMS & GDP) \] .................................(i)

Where;

IPI = Industrial Production Index
EXR = Exchange Rate
CPI = Consumer Price Index
INT = Interest Rate
M2 = Broad Money Supply
FDI = Foreign Direct Investment
CMS = Credit to Manufacturing Sector
GDP = Gross Domestic Product.

In log stochastic form, equation 1 becomes:

$$IPI = \alpha + \beta_1 EXR + \beta_2 CPI + \beta_3 INT + \beta_4 M2 + \beta_5 FDI + \beta_6 CMS + \beta_7 GDP + \mu \ldots \ldots (ii)$$

Where:

$\alpha = \text{Constant}$

$\beta_1 - \beta_7 = \text{Parameters to be estimated.}$

A priori expectations: $\beta_1 > 0$, $\beta_2$, $\beta_3 < 0$; $\beta_4$, $\beta_5$, $\beta_6$, $\beta_7 > 0$

**Unit Root Test:** The Augmented Dickey Fuller (ADF) and the Phillips-Perron tests were used to test for unit roots as in the equation below.

$$\Delta Y_t = C_i + \omega Y_{t-1} + C_{2i} + \sum_{t=1}^{p} \delta t \Delta Y_{t-1} + \epsilon_t.$$ \ldots \ldots (iii)

$y_t = \text{relevant time series, } \Delta = \text{an operator for first difference, } t = \text{a linear trend and } \epsilon_t = \text{error term.}$

The null hypothesis of the existence of a unit root is $H_0: \omega = 0$. Failure to reject the null hypothesis leads to conducting the test on further differences of the series. Further differencing is conducted until stationarity is reached and the null hypothesis is rejected at the 5 percent critical level.

**DATA AND DISCUSSION**

Table 1 is the unit root result that tested for the stochastic properties of the series. The test was carried out at both levels, first and second difference for the ADF and Phillips-Perron tests. Integration of order one and two was denoted by I(1) and I(2) respectively and we presented I(2) only when stationarity was not achieved at I(1). Thus, at 5% percent critical level, all the series were I(1) variables except M2 and FDI which were I(2).

**Table 1: Unit Root Test Result (with trend and intercept)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF Test</th>
<th>PP Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>$1^{st}$ diff</td>
</tr>
<tr>
<td>LIPI</td>
<td>-2.0238</td>
<td>-3.61044</td>
</tr>
<tr>
<td>LEXR</td>
<td>-1.2476</td>
<td>-4.1316</td>
</tr>
<tr>
<td>LCPI</td>
<td>-1.2489</td>
<td>-3.9716</td>
</tr>
<tr>
<td>LINT</td>
<td>-2.8868</td>
<td>-5.9994</td>
</tr>
<tr>
<td>LM2</td>
<td>-2.8166</td>
<td>-2.3892</td>
</tr>
<tr>
<td>LFDI</td>
<td>-2.3387</td>
<td>-3.1356</td>
</tr>
<tr>
<td>LCMS</td>
<td>-3.4929</td>
<td>-5.3234</td>
</tr>
<tr>
<td>LGDP</td>
<td>-1.9988</td>
<td>-3.6672</td>
</tr>
</tbody>
</table>

Table 2 is the OLS regression estimated with their respective order of integration. Inverted root was included in the regression to correct for the presence of serial correlation. Consequently, the DW statistic depicts absence of serial correlation as 1.92 falls within the range of no
autocorrelation of 1.59-2.41. The F-stat shows that the combined variables in the model are statistically significant while the R square reveals that the explanatory variables explain about 73 percent of industrial production index in Nigeria in the period under review.

### Table 2: Regression Estimates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std error</th>
<th>t-statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.848205</td>
<td>3.259754</td>
<td>-0.260205</td>
<td>0.7972</td>
</tr>
<tr>
<td>LEXE</td>
<td>0.167608</td>
<td>0.078102</td>
<td>2.146024</td>
<td>0.0437</td>
</tr>
<tr>
<td>LCPI</td>
<td>-0.025008</td>
<td>0.024984</td>
<td>-1.000968</td>
<td>0.3282</td>
</tr>
<tr>
<td>LINT</td>
<td>0.164524</td>
<td>0.092411</td>
<td>1.780346</td>
<td>0.0895</td>
</tr>
<tr>
<td>LM2</td>
<td>-0.190743</td>
<td>0.143692</td>
<td>-1.327438</td>
<td>0.1986</td>
</tr>
<tr>
<td>LFDI</td>
<td>0.113519</td>
<td>0.084730</td>
<td>1.339785</td>
<td>0.1946</td>
</tr>
<tr>
<td>LCMS</td>
<td>-0.053030</td>
<td>0.049119</td>
<td>-1.079626</td>
<td>0.2926</td>
</tr>
<tr>
<td>LGDP</td>
<td>0.480958</td>
<td>0.326454</td>
<td>1.473278</td>
<td>0.1555</td>
</tr>
<tr>
<td>AR(1)</td>
<td>0.259985</td>
<td>0.193828</td>
<td>1.341321</td>
<td>0.1941</td>
</tr>
</tbody>
</table>

$R^2 = 0.73$, $F$-stat = 6.88, DW = 1.92

A cursory look at the result reveals that consumer price index, broad money supply and credit to manufacturing sector exert negative impact on industrial development in Nigeria. On the other hand, the impact of exchange rate, interest rate, FDI and real GDP on industrial production index is positive. Unfortunately, M2 and CMS do not conform to a priori expectation while only exchange rate is statistically significant. The result further shows that elasticity coefficient is inelastic showing the degree of responsive of industrial productivity index to changes in any of the explanatory variables. This means that the response of industrial production to changes in the explanatory variables is less than proportionate change.

### CONCLUSION AND RECOMMENDATION

The study is part of larger research agenda aimed at analyzing the determinants of industrial development in Nigeria. Macroeconomic variables which include industrial production index, exchange rate, consumer price index, interest rate, broad money supply, foreign direct investment, credit to manufacturing sector and gross domestic product were employed. An OLS technique of analysis was employed after testing for stochastic properties of the series using ADF and PP tests. It was discovered that exchange rate exert significant positive impact on industrial productivity in Nigeria. This is not surprising because a rise in the exchange rate which reflects an appreciation for the Naira will make it easy to import capital equipment that will expand productivity in Nigeria. Interest rate appeared positive contrarily to expectation where it is assumed that increase in interest rate discourage borrowing and reduce investment and productivity. However, the positive signed may be due to the fact that high interest rate encouraged saving that make loanable fund available and the long run result may be to boost investment and productivity. But the fact that it is not significant at 5 percent shows that its contribution to industrial productivity is very little. Similarly, the positive contribution of FDI and real GDP seems not to exert meaningful impact on industrial productivity in the period under review since they are statistically insignificant.

On the other hand, broad money supply and credit to manufacturing sector does not conform to a priori signs. This may mean that M2 has not been effectively used to control monetary variables whose impact should in turn affect industrial productivity while the amount of credit advanced to
the manufacturing sector is not the type that will boast productivity in the industrial sector. Such credits are often inadequate which does not make the manufacturing sector viable. However, consumer price index (proxy for inflation) exerts negative impact on industrial productivity and is in line with a priori expectation. This is because a rise in inflation should increase cost of production and a fall in industrial productivity is inevitable. It is therefore recommended that a workable M2 that can enhance credit to manufacturing sector and at the same time control interest rate to boast investment should be determined. Efforts should also be intensified to boast FDI and level of income in the economy.

REFERENCES


