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Manufacturing Capacity Utilization and Industrial Development in Nigeria: An Assessment (1976 – 2005)

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Abstract

This paper investigates the impact of manufacturing capacity utilization on industrial development in Nigeria during the period of 1976 – 2005. Manufacturing capacity utilization, value added and employment generation were regressed on index of industrial productivity (which served as the proxy for industrial development) using the co-integration and error correction mechanism as analytical tools. The time series properties of the variables were investigated by conducting a unit root test and further to the co-integration analysis. The econometric evidence confirms that there is a long run positive relationship between Manufacturing capacity utilization, value added and index of industrial productivity in Nigeria. It was recommended based on this relationship that as a result of the low capacity utilization experienced in Nigeria, the government should rectify the infrastructural inadequacies by revamping the nation's deteriorated infrastructural facilities and encourage local sourcing of raw materials and the provision of intermediate products to improve the manufacturing value added and generate mass employment in Nigeria.

Introduction

The manufacturing sector plays a catalytic role in a modern economy and has many dynamic benefits that are crucial for economic transformation. That is, the manufacturing sector serves as a catalyst for economic growth and development, as well as the bedrock of every economy. In an advanced economy, the manufacturing sector is a leading sector in many respects. This buttressed Lewis (1967) who stated that in any economy, one or more sector serves as the prime mover, driving the rest of the economy forward.

It is an avenue for increasing productivity in relation to import substitution and export expansion, creating foreign exchange earning capacity, raising employment and per capita income, which widen the scope of consumption in dynamic patterns. Furthermore, it promotes the growth of investment at a faster rate than any other sector as well as wider and more efficient linkage among different sectors (Ogwuma, 1995).

The growth of industries in Nigeria may be investigated through the study of such vital indices of growth of value added, employment in modern establishment, capital formation in the sector, coverage of products industrialized and changes in trade structure. A cursory look at some concentrations of industrial development in Nigeria may lead to a misleading picture of a high state of industrialization in Nigeria. For a country of the size of potential in Nigeria, manufacturing is essential if the country is to achieve rapid economic and social development. This recognition of the importance of manufacturing industries in the growth process is linked with the choice of an appropriate strategy of industrial development.

Industrial development therefore is the application of modern technology, equipments and machineries for the production of goods and services, alleviating human suffering and to ensure continuous improvement in their welfare. Modern manufacturing processes are characterized by high technological innovations, the development of managerial and entrepreneurial talents and improvement in technical skills which normally promote productivity and better living conditions. In recognition of this, successive governments in Nigeria have continued to articulate policy measures and programme to achieve industrial growth and development. This cannot be attained until manufacturing capacity is utilized to a reasonable extent.

Fabayo (1982), coined capacity under-utilization as a phenomenon which obtains when for one reason or the other, an industry is unable to fully utilize its installed scale of plant on a sustained basis. The manufacturing capacity utilization in the late 1970s was as high as 78.70 percent and nosedived to as low as 43.80 percent in the 1980s. Between 2000 and 2005, it oscillated around 34.60 and 52.78 percents. The manufacturing value added and employment generation which were also determinants of industrial development, oscillated within the same period. These were attributed to the infrastructural inadequacies and low incentives put in place to boost manufacturing productivity in Nigeria. Ayodele and Falokun (2005), even noted that the introduction of the Structural Adjustment Programme (SAP) did not ameliorate this problem but rather aggravated it as experienced through a regime of high inflation rate which makes domestic manufacturers and domestic market uncompetitive.

From the foregoing, the trend of utilizing capacity in the manufacturing sector and how it has been enhancing industrial development has remained less/unascertained. This therefore prompted the investigation in this study.

Literature Review

Shonekan (1985) noted that in a less developed country like Nigeria, to bring about profound changes required in the manufacturing and industrial sector, create new agro-based industries and attain a higher productivity, Nigeria will need a substantial amount of new capital equipment. This is a sufficient evidence to regard capital shortages as an important limitation to the development of industries, thereby retarding industrial development in Nigeria.

Between 1990 and 1996, the manufacturing sector recorded a negative annual growth rate of 1.6 percent. Consequently, the contribution of the sector to GDP fell from 11.2 percent in 1982 to 4.8 percent in 1996 and later 6.79 percent in 1999. The CBN report (1997) captured it that cost of raw materials accounted for 69.5 percent of the total cost of operations while wages and salaries, interest changes, depreciation and energy accounted for 7.5, 5.5, 3.5 and 2.9 percents respectively. Aggregate value of raw materials used increased by 43.5 percent, locally sourced materials accounted for 48.3 percent of the total cost of raw materials used, imported raw materials accounted for 51.7 percent, manufacturing value added declined by 40.8 percent and overall investment expenditures of manufacturing enterprises declined by 0.8 percent in 1997.

Oloyede (1976) opined that the strategy of import-substitution, which is generally favoured in Nigeria, relies heavily on importation and does not sufficiently use local reserves. This has resulted in high production cost for manufacturers, low value added retained in the economy and depletion of international reserves. Consequently, the bulk of manufacturing capacity continued to remain unutilized while the provision of public utilities and other social services has deteriorated.

Ekpeyong (1992) observed that the rate of interest, as well as the inflation rate prevailing in an economy can affect the level of output in industrial sector. These two key factors determine the amount of loan and advances that can be made available to investors and producers to improve their productivity and efficiency.

Ukoha (2000) also investigated the determinants of capacity utilization in the Nigerian manufacturing industry between 1970 and 1998. He found out that the exchange rate, federal government capital expenditure on manufacturing and per capita real income has positive effects on manufacturing capacity utilization. However, inflation and loans and advances to manufacturing were found to have negative effect. Improving capacity utilization in the Nigerian manufacturing sector will enhance growth of the sector which will subsequently result in industrial development in Nigeria.

A large amount and a sustaining growth rate in manufacturing value added are very necessary in order to ensure and maintain a desirable level of industrial productivity. For instance, the Nigerian manufacturing value added fell in 1985 from 5,954,697 to 1,357,907 in 1989 which also adversely affected industrial output to fall from 12,448,317 to 2,999,709. During this period, there was no incentive for industrial development.

Methodology

In an attempt to model the effect of manufacturing capacity utilization on industrial development in Nigeria, an explanation on the co-integration and the associated error correction mechanism (ECM) is presented, which serves as an economic tool of analysis of this paper. This is because co-integration is capable of combining short-run dynamics with long-run equilibrium in structural economic modeling.

The model is specified as:

$$\text{LNIND} = \alpha_0 + \alpha_1 \text{LNMCU} + \alpha_2 \text{LNMVA} + \alpha_3 \text{LNMEG} + U \dots \dots \dots \text{(i)}$$

Where;

LNIND=Logarithm function of index of industrial production

LNMCU= Logarithm function of manufacturing capacity utilization

LNMVA= Logarithm function of manufacturing value added

LNMEG= Logarithm function of manufacturing employment generation

α_0 = Intercept of the model

α_i 's = Regression parameters

U = White noise

The estimation of the model as highlighted by koutsoyiannis (2001:16), is a purely technical stage which requires the knowledge of the various economic methods, their assumptions and economic implications for the estimate of the parameters.

Thus, specifying the model in ECM, it becomes;

$$\text{IND} = 0 + \varepsilon_1 \log(\text{MCU})_{t-1} + \varepsilon_2 \log(\text{MVA})_{t-1} + \varepsilon_3 \log(\text{MEG})_{t-1} + \varepsilon C_{t-1} + \varepsilon_t \dots \dots \dots$$

(ii)

Where

εC_{t-1} = Error correction term lagged by one period

According to Engle and Granger (1987), a unit root test will first be performed on each variable in the model using the Augmented Dickey Fuller (ADF) test.

The equation is specified as:

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \varepsilon_t \dots \dots \dots \text{ (iii)}$$

Where

Y_t represents the vector of the variables considered in this paper.

To determine the number of co-integrating vector, Johansen procedure shall be employed. The maximum likelihood procedure (Johansen's test) suggested by Johansen (1988 and 1991) is particularly preferable when the number of variables in the study exceeds two variables due to the possibility of existence of multiple co-integrating vectors. The advantage of Johansen's

test is not only limited to multivariate case, but it is also preferable than Engle – Granger approach even with a two – variable model (Gonzalo, 1990).

Data Analysis and Discussion

Augmented Dickey Fuller (ADF) tests for stationarity indicate that LNIND, LNMVA and LNMEG are integrated of order 1 while LNMVCU is integrated of order 2. The univariate analysis of the non-stationary series indicate that these variables can be characterized as I(1) and I(2) processes. The table below shows the result of the stationarity test for all the variables used after comparing the ADF value against the Mackinnon critical value at 1% as specified in table 1 below.

Following Engle – Granger (1987), we obtained the result of the co-integration estimation using the maximum likelihood procedure which is presented in table 2.

Given that the residuals from the co-integrating regression are stationary, and that the variable are co-integrated, then we proceed to estimate the error correction model (See table 3)

The result of the regression equation shows the initial overparametised error correction model, which identifies the main dynamic patterns in the model. The variables received unequal lagged periods, for instance, the index of industrial productivity (LNIND), manufacturing capacity utilization (LNMVCU) and manufacturing employment generation (LNMEG) were only lagged equally by one period, while manufacturing value added (LNMVA) is not lagged by one period because it is stationary at levels, that is, zero.

The overparametised equation is then further simplified until data coherent results are achieved.

The result of the relationship between manufacturing capacity utilization, manufacturing value added at the current level of industrial output were considered which revealed that there is positive and significant relationship between MCU, MVA and IND. A1 percent change in manufacturing capacity utilization and manufacturing value added lead to 0.043 and 0.109 changes in industrial productivity. Considering the standard error, the estimate is statistically significant.

The result also shows that only the first lagged value of index of industrial productivity is recognized. The result shows a positive sign which conforms

with the time series analysis that the past values of a time series exert a positive impact on the subsequent values. The t-statistic shows that the first lagged value of the index of industrial productivity [INDP (-1)] has significant effect on the current value of the index of industrial productivity. The t-statistic of manufacturing capacity utilization shows that the present level of MCU have no significant effect on the current level of industrial output over the examined years (1975-2005).

These findings were buttressed by Ayodele and Falokun (2005), that in spite of the reform measures undertaken by the Structural Adjustment Programme (SAP), the manufacturing sector has not responded positively through high growth rate. Instead, domestic inflation has risen high, showing that the objective of price stability and subsequently increased industrial productivity has not been fulfilled. With inflation in excess of 20 percent, domestic manufacturers cannot be competitive even in the domestic market.

The coefficient of multiple determination which explains the explanatory power of the model implies that 88 percent variation in the industrial productivity is accounted for by variations in MCU, MVA and IND (-1). Fashola (2004) in his writing on the requirements for optimal industrial development in Nigeria, discusses the stochastic error term that were not specified when he identified the factors influencing the manufacturing sub-sector in Nigeria as price stability, stability of real exchange rate, adequate and efficient infrastructural inputs, foreign direct investment, administrative efficiency, accountability and political stability.

The overall statistical significance of the model indicates that the model specified is appropriate. This is indicated by the large value of F-statistic which is 38.71. It shows that the estimate is statistically different from zero at 5 percent level of significance. This implies that manufacturing value added, manufacturing capacity utilization and manufacturing employment generation have significant effect on industrial output in Nigeria. Also, the value of the error correction mechanism (ECM) which indicates the speed of adjustment shows a negative sign and this implies its significance level. This is to say that the error correction mechanism will be able to correct any deviation from the long run equilibrium relationship between the industrial productivity and the explanatory variables.

Conclusion and Recommendation

After examining the issue of manufacturing capacity utilization in the industrial sector of Nigeria, it was deduced that there are still some relatively high rate of capacity under-utilization or idle capacity. This has greatly affected the contribution to industrial development. The industrial sector is known to have contributed to a large extent to the industrial development and gross domestic productivity (GDP) of the Nigerian Economy, and as well serves as one of the highest employers of labour.

Distortions such as high reliance on foreign inputs and the neglect of research still characterize the Nigerian industrial sector, even after the implementation of SAP. The structure and performance of the sector have not changed dramatically from the pre-SAP era which has greatly contributed to low capacity utilization and subsequently retard industrial development in Nigeria.

Also, the different components of the industrial sector suffer weak technical and functional linkages not only with each other but also with the rest of the economy. Productivity in Nigerian industrial sector has been low because of a variety of factors which include serious infrastructural problems (electricity, water, transport and communication), lack of raw materials, e.t.c.

It is obvious that manufacturing capacity utilization accounts for increased productivity and industrial development in every economy. This has not been the case concerning the Nigerian economy. What is being experienced is manufacturing capacity under-utilization with its attendant problems. Nevertheless, the findings of this paper recommend the following measures to revitalize the Nigerian industrial development.

The empirical results show that there is long run positive relationship between the present value of manufacturing capacity utilization and industrial productivity, but the magnitude of the influence is relatively low - about 4.3 percent. This simply means that government should ensure that infrastructural inadequacies are rectified. This could be achieved by revamping the nation's deteriorated infrastructural facilities such as roads, electricity, telecommunications, e.t.c. Current efforts at rehabilitating the power generating units and deregulating the telecommunication facilities are steps in the right direction. Moreover, necessary actions to objectively privatize these services should be intensified to ensure greater efficiency and serve as a solid foundation for industrial take off.

Manufacturing value added also has a weak positive influence on industrial productivity, which is reflected by its value of 1.1 percent. This is as a result of the continued importation of raw materials and finished goods. The government should hereby embark on core industrial project to facilitate local supply of raw materials and intermediate products that would bring about the much-needed backward integration in the economy. Improved local sourcing of raw materials will undoubtedly reduce cost of production and boost employment generation, thereby making locally manufactured products' price competitive, both in the local and international markets.

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Table 1: Unit Root Test

Variable	ADF Value	Mackinnon Critical Value at 1%	Order of Integration
LNIND	-5.13	-3.77	I(1)
LNMCU	-5.23	-3.71	I(2)
LNMVA	-5.21	-3.75	I(1)
LNMEG	-6.89	-3.75	I(1)

Table 2: Co-integration Test Using Johansen Procedure.

Eigen Value	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No of CE(s)
0.740510	66.20676	47.21	54.46	None**
0.586330	32.48081	29.68	35.65	At Most 1*
0.252030	10.41364	15.41	20.04	At Most 2
0.118520	3.153817	3.76	6.65	At Most 3

Note: *(**) denotes rejection of the hypothesis at 1% (5%) level of significance. L. R. tests indicate 2 co-integrating equations at 5% and 1% significance level.

Table 3: The Overparameterised Model

Variable	Coefficient	Std Error	t-statistics	Prob.
C	0.753045	1.143151	0.658745	0.5180
LNIND(-1)	0.786999	0.162018	4.857476	0.0001
LNMCU	0.343378	0.283975	1.209185	0.2414
LNMCU(-1)	-0.355327	0.304989	-1.165049	0.2584
LNMEG	-0.011263	0.031489	-0.357668	0.7245
LNMEG(-1)	-0.000877	0.034637	-0.025307	0.9801
LNMVA	0.081408	0.061623	1.321054	0.2022
ECM(-1)	-0.011614	0.195517	-0.059403	0.9533

R-squared = 0.8844

Adjusted R-squared = 0.8419

F-Statistic = 20.77

Durbin-Watson Statistic = 2.53

Table 4: The Parsimonious Model

Variable	Coefficient	Std Error	t-statistics	Prob.
C	0.172826	0.930229	0.018578	0.9853
LNIND(-1)	0.854762	0.139211	6.140026	0.0000
LNMCU	0.042981	0.107797	0.398724	0.6939
LNMVA	0.109593	0.053544	2.046786	0.0528
ECM(-1)	-0.137663	0.155710	0.884100	0.3862

R-squared = 0.8756

Adjusted R-squared = 0.8530

F-Statistic = 38.71

Durbin-Watson Statistic = 2.1988