

Original Article

# Analysis of Firm Dynamics by Productivity: Evidence from Nigerian Manufacturing and Service Sectors

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**Abstract** - Using the World Bank Enterprise Survey data of 2014 which covered a total of 2,676 firms across Nigeria, this study analyzes the productivity of Nigerian manufacturing and service firms. Specifically, it examines firm characteristics responsible for productivity and compares the productivity of manufacturing and service sectors. It adopts labor productivity as a measure of productivity and defines labor productivity as the ratio of average monthly sales to the number of workers. The method of Ordinary Least Squares (OLS) regression analysis was used to analyze the relationship between productivity and its determinants. The result suggests that there is a significant return to wages which implies that adequate remuneration motivates workers' productivity, and smaller firms are more productive than bigger firms. However, there is no significant difference between productivity in the manufacturing and service sectors.

**Keywords** - Productivity, Manufacturing, Service, Firm, Sector, Nigeria.

## I. INTRODUCTION

Nigeria is the largest economy in West Africa. It has promoted rapid economic growth through public investments in infrastructure, supporting smallholder agricultural production, and providing incentives for private sector investments. National income has grown favorably, especially in 2004 where it attained a peak of 19.17 percent (NBS, 2017). Agricultural production has grown to create a great impact in terms of contributions to the Gross National Income (GDP) (NBS, 2017). However, despite efforts that have been aimed at achieving high growth and development objectives, economic performance has dwindled from time to time. One of the economy's worst performances, before the all-time low of -1.5 in 2016, was in 1983 where it recorded a contraction of -7.81 percent (NBS, 2017). This sharp fall in economic performance was consequent to the oil boom of the 1970s. With an increase in global oil prices and the rush for Nigerian oil, the agricultural sector was ignorantly abandoned. A series of events

that can be linked to mismanagement of public resources coupled with the avariciousness of nation leaders led the economy into the dire state in which it has been struggling thereafter to recuperate.

In what appears to be a positive economic outlook, the real sector has recorded growth in recent years. CBN (2017) reported that since exiting from recession in the second quarter of 2017, the manufacturing sector has continued to make tremendous impacts on the economy. As contained in the Purchasing Manager's Index report of the Central Bank of Nigeria for December 2017, the manufacturing sector has expanded for nine months since April 2017. The Purchasing Managers Index (PMI), is used to measure the health of the manufacturing sector based on five major indicators: new orders, inventory levels, production, supplier deliveries, and the employment environment. For new orders, the report maintains that at 60.0 points the new orders index grew for all nine months showing that there was an increase in new orders. It affirmed that thirteen out of a total of sixteen subsectors reported growth. For inventory levels, the inventories index witnessed growth at a faster rate than previously witnessed. It gained 61.1 points and eleven of the subsectors recorded growth. For production, the production level index recorded 63.2 points which means that production increased with eleven of the sixteen subsectors witnessing this growth. For supplier deliveries index, the report affirms that the supplier delivery index recorded growth at 57.4 points, indicating faster delivery time for seven months with eleven subsectors witnessing growth. For the employment environment, the employment level index stood at 53.9 points indicating growth in employment level. Nine of the subsectors increased their employment levels.

Extended economic recession followed by the collapse of the world oil market from the early 1980 and the concurrent fall in earnings of foreign exchange has been unfavorable to economic growth and development in Nigeria (Anyanwu 2004). Non-farm enterprises can play a significant role in promoting economic diversification. The prospect of Nigeria becoming the leading economy in Africa



could be realized but the opportunities available in the non-oil sectors have to be properly harnessed. As opined by Ehigbator (2017), the problem of the Nigerian economy is not lack of diversification per se, but enhancing the performance of other sectors. This goes to say that promoting diversification by encouraging nonfarm enterprises should be associated with enhancing their performance. Just as Nagler and Naude (2014) noted, nonfarm enterprises appear everywhere in Africa but little is yet known about their productivity. Enterprises under the manufacturing and service sectors are part of these 'non-farm' enterprises. These enterprises are estimated to employ 15 percent of the population (Fox and Sohnesen 2013). Studies reveal that the income contribution of these enterprises is significant. It becomes imperative therefore to get to know the productivity levels of these enterprises since more productive enterprises tend to benefit the general economy.

Nigeria has made remarkable progress in the structural transformation of the economy, the non-oil sectors are now the key drivers of the economy, but the problem still lies in the fact that the sectors' full potentials are not being harnessed. It is an established fact that non-farm enterprises are all-over Africa, particularly in Nigeria and they play an important role in the economy. However, the productivity levels of these enterprises are not known and this creates a problem. Start-ups need to make a decision on whether to engage in manufacturing or service business and knowledge on the sectors' productivity can go a long way in influencing this decision. Apart from examining the impact of these enterprises on the economy, one needs to identify factors that affect productivity among firms. Again, most of these enterprises are often associated with a shorter lifespan especially those with a smaller scale of operation. Thus, it is of vital importance to evaluate reasons for their failure and proffer solutions to ensure enterprise sustainability.

Building on the above discussion, this study attempts to answer the following questions:

- Is the manufacturing sector more productive than the service sector?
- Do firm characteristics such as; wage and size of the firm have any effect on productivity?

The aim of this study is to determine the level of productivity in Nigerian service and manufacturing enterprises. The specific objectives include;

- To compare the Nigerian service and manufacturing sectors in terms of productivity.
- To identify firm characteristics that influence productivity.

The rest of this study is organized as follows. Section two presents the review of related literature. Section three presents the research methodology. Results and discussion of findings are presented in section four while the conclusion of the study is presented in section five.

## II. REVIEW OF LITERATURE

Evaluating Heshmati and Rashidgalam (2016), it is evident that a good number of academic works have attempted to analyze labor productivity and its determinants. Xiaodong (2015) studied the impacts of high-temperature conditions on construction labor's productivity and their results revealed that the heat stress imposed on the human body due to high-temperature environments reduces labor productivity in the construction industry. Baptist and Teal (2015) found heterogeneity in production functions and technology to be an important source of variations in firm outcomes in Africa and these proved more important than education in explaining differences in output per worker. Suffice it to say that there is some level of technological diversity within Africa with more dependence on raw materials in poor countries and higher returns to education in richer countries. Based on their result, they suggest that development policy should consider technological change as a mechanism to increase growth as well as augmenting factor stocks or total factor productivity.

The work of Arnold et al. (2006) is very relevant to this study. Using the method of Ordinary Least Squares, they analyzed the relationship between the productivity of manufacturing firms and their access to service inputs and found that a positive relationship exists between the performance of manufacturing firms and availability of services; therefore, there is a positive correlation between the service sector and manufacturing sector. Nagler and Naudé (2014) measured labor productivity in rural African enterprises. They discovered that rural enterprises were on average less productive than those in urban areas, that female-owned enterprises were less productive than male-owned ones and enterprises located close to population centers were more productive than those that are farther away. They provided evidence that enterprises which operated throughout the year were more productive. According to their analysis, gender, education, and access to finance and location mattered for labor productivity in rural Africa and that policy decision tackling shortcomings could significantly contribute to a better business environment and increased labor productivity. An additional factor that may affect an enterprise is location. Location, on the one hand, is affected by weather conditions such as climate and rainfall which influence agricultural productivity, on the other hand, it is also affected by economic geographies such as distance from an urban center

and market access, reflecting demand and competition.

Ogutu et al. (2014) assessed the impact of information and communication technology (ICT) based market information services (MIS) on Kenyan smallholder farms' input use and productivity. Their study found that participation in the ICT-based MIS project had a positive and significant effect on the use of purchased seeds, fertilizers, labor, and land productivity, but it had a negative and significant impact on the use of hired, family, and total labor. Heshmati and Su (2014) studied the development and source of labor productivity in 31 Chinese provinces during 2000-2009. They identified several determinants of labor productivity and found that the share of industry output, investments in fixed assets, the total volume of telecommunication investments, enterprises' profits, and the average wage for labor, had positive effects on labor productivity both when productivity was measured in level and in growth rate forms.

Sala and Silva (2011) reveal that vocational training is important in determining productivity. They constructed a multi-country, multi-sectoral dataset and quantified empirically to what extent vocational training had contributed to an increase in the growth rate of labor productivity in Europe between 1999 and 2005. According to this study, one extra hour of training per employee accelerated the rate of productivity growth by around 0.55 percentage points. Rijkers et al. (2010) analyzed the productivity of manufacturing enterprises in rural Ethiopia. The authors found that rural enterprises were less productive than urban ones, and reported an output per labor ratio for remote rural enterprises of 0.43, while it was 0.95 for enterprises in rural towns and 2.30 for enterprises in urban areas. Söderbom and Teal (2004) and Söderbom et al. (2006) found that more productive firms tended to survive longer in Africa. This however happened only in cases when these enterprises had already attained a certain firm size and scale in production that enhanced their survival.

Just as Sala and Silva (2011) found that vocational training promotes productivity, Dearden et al. (2006) learned that on-the-job training is positively associated with productivity. Particularly, they found that for a panel of British industries, a 1.0 percent increase in work-training raised the value-added as well as the hourly wage, per hour by about 0.6 percent and 0.3 percent respectively. As opined by Frazer (2005), the reason for the abysmal performance of most African firms could be attributed to government policies and performance as well as historical circumstances. Using enterprise-level data from Ghana, he confirmed that less productive enterprises were more likely to predecease more productive ones.

Wei (2000) in his work on China discovered that a positive relationship existed between fixed investments and real GDP per capita. Some studies have also studied the performance of female-headed enterprises. According to these studies, female-headed enterprises were less productive than male-headed ones. Other studies have found that a poor business environment reduces enterprise productivity and growth. Results also show that indirect costs affect firm performance. In general; research indicates that aid support targeting female entrepreneurs is more productive in creating employment opportunities, reducing risks of defaults, increasing family welfare, reducing poverty, and possibly even increasing survival of the firms. Some authors have identified variables that could jointly influence the investment climate to include infrastructure, access to finance, security, and of course a regulatory framework that protects property rights.

In sum, existing literature has helped identify the key determinants of labor productivity in manufacturing and services in both developed and developing countries. Among others, it suggests that environmental factors such as high-temperature conditions influence labor productivity negatively in some industries like construction and possibly even an open space working environment such as agriculture. Productivity differences can be large when rural and urban located firms are compared. This is very likely attributed to differences in education, skill, productive capital, and other urban-biased development infrastructure. Gender-related differences are found to exist in firm operation and management which could very likely be linked to gender discrimination in the form of objectives, access to financial sources, culture, level of education, etc. Export orientation, innovative activities and training programs not only influence the survival and growth of firms but also their labor productivity positively (Kang et al., 2008; Oh et al., 2009). In the case of African firms, it seems that policy decisions tackling market shortcomings could significantly contribute to a better business environment and increase labor productivity. Heshmati and Rashidghalam (2016) analyzed labor productivity and its determinants for the Kenyan manufacturing and service sectors. Their study identified certain factors that encouraged productivity to include training of workers, education level as well as managerial experience of enterprise owners. They noted that capital intensity and wages significantly and positively affected labor productivity. Obstacles in access and use of utilities and infrastructure discouraged high labor productivity. Their study further confirmed the hypothesis that an increase in female participation reduced labor productivity. However, when female education increases by one year, it contributes positively to productivity.

From the literature factors that influence productivity range from those affecting individuals, enterprises, as well as enterprise owners. Firm inherent characteristics that affect productivity include size, location; characteristics that could influence individuals to include wage and for the enterprise owner gender, age, educational level. Furthermore, rural enterprises are on average less productive than urban ones. Location is important in determining productivity and enterprises clustered together are more productive as they enjoy some economies like knowledge spill-overs. Also, female-owned enterprises are on average less productive than male-owned ones while women participation rates are lower (see Nagler and Naude 2014; Costa and Rijkers 2012)

Heshmati and Rashidghalam (2016) analyzed labor productivity and its determinants for manufacturing and service sectors in Kenya. Besides identifying determinants of labor productivity, their work further confirmed that female participation reduces labor productivity. But, when female education increases by one year, it contributes positively to productivity.

While size seems potentially relevant in determining productivity, certain factors identified by Frazer (2005) as to the reasons why firms may exit the market are capital intensiveness, low productivity, firm age. It is expected that older and larger firms survive longer. As has been observed by Nagler and Naude (2014), not only do rural enterprises have lower productivity than urban ones but they are more likely to exit the market. This goes to affirm that productivity explains performance and increased productivity assures a longer life span for firms.

### III. RESEARCH METHODOLOGY

#### A. Model Specification

It has been observed in the work of Nagler and Naude (2014) that “enterprise productivity refers to how efficiently enterprises transform inputs into outputs”. Different measures of productivity exist such as the total factor productivity. However, drawing extensively from the literature, the method of analysis for this study follows that of Heshmati and Rashidghalam (2016) and loosely the work of Nagler and Naude (2014). A partial measure of productivity is used, thus;

$$\text{Labour productivity} = \frac{\text{average monthly sales}}{\text{number of workers}}$$

The reason for adopting a partial measure of productivity is that the capital variable is unaccounted for due to data limitations. Labour productivity is a good measure of productivity because labor can be estimated more easily than other inputs like capital. An added advantage of using this particular ratio is that output is a good yardstick for

productivity as changes in quality can be reflected in prices and values. Also, levels of labor productivity reflect welfare and development levels. However, it is important to note that even though the ratio of output to persons in production to labor hours is labor productivity, it does not necessarily mean that labor is the only factor responsible for changes in this ratio. According to Heshmati and Rashidghalam (2016), productivity is generally defined as a measure of physical output produced from a given quantity of inputs. It is a ratio to show how effectively and efficiently a firm or organization turns a set of inputs into a product or service.

The variables used for this study range from factors affecting the enterprise and enterprise owner. This was done in order to capture all factors that could possibly influence enterprise productivity. Therefore, enterprise productivity can be seen as a function of enterprise years of operation (YOP), access to credit (ACC), enterprise size (SIZE), enterprise location-captured by distance to industrial and export zones (LOC), gender, educational level of enterprise head, and other main characteristics like wages (WAGE) and technology (TECH). In other words;

$$\text{LnLPROD} = \beta_0 + \beta_1\text{YOP} + \beta_2\text{SEX} + \beta_3\text{LOC} + \beta_4\text{EDU} + \beta_5\text{ACC} + \beta_6\text{TECH} + \beta_7\text{SIZE} + \beta_8\text{FIRMSECTOR} + \beta_9\text{lnWAGE} + \mu_t \dots \dots \dots \text{Equation I}$$

**Table 1. Expected signs of the variables**

Variables	Sign
YOP	+
SEX	+
LOC	+
EDU	+
ACC	+
TECH	+
SIZE	+
FIRMSECTOR	+ or -
WAGE	+

Table 1 shows the expected signs of the variables. These variables have been carefully selected to capture specific characteristics of the enterprise as well as the enterprise head. The dependent variable LPROD, which is the log of labor productivity, accounts for enterprise productivity. The log of this variable is adopted to make it easier for the variables selected to be able to explain productivity. The log of wage is also taken, so that wage can better explain labor productivity. Without the log the variables were displaying exponential values, this would have made the model insignificant in explaining productivity. Other variables were carefully selected based on the literature and the expected connection between them and Nigerian firms. LPROD refers to enterprise productivity. It is

the dependent variable, which is captured as the log of labor productivity. YOP is the number of years of enterprise operation. It looks at how long the firm has survived in the market. It is also known as the age of the enterprise. SEX refers to the gender of the firm head. The variable helps to compare the productivity of male-headed enterprises to female-headed enterprises. LOC refers to the location of the firm. It is captured by the distance of the enterprise to market. The belief is that, the closer an enterprise is to a population center, the greater the level of productivity. EDUC refers to the educational level of the enterprise owner. ACC captures enterprise access to credit. TECH is a technological license. It captures whether the enterprise uses technology. SIZE refers to enterprise size. It is expected that bigger enterprises will be more productive. FIRMSECTOR accounts for whether an enterprise is in manufacturing or service. lnWAGE refers to wages and salaries of the firm workers. The log of wage refers to the natural log of wages and salaries to the workers in the firm.  $\beta_0$  is the intercept term also known as the constant while  $\mu_t$  is the error term.

The dataset for this work as with the work of Heshmati and Rashidghalam (2016) is from the World Bank's Enterprise Survey (ES). The Enterprise Survey (ES) is a World Bank program where they collect data from key manufacturing and service firms in every region of the world. The surveys use standardized survey instruments and a uniform sampling methodology to minimize measurement errors and to yield data that are comparable across the world's economies and as such are suitable for comparative economic studies (Heshmati and Rashidghalam, 2016). The dataset comprises observations from Nigeria's service and manufacturing firms in 2014.

### B. Estimation Techniques

Formally, labor productivity can be estimated thus;

$$LPROD = X'\beta^1 + Z'\delta^1 + \mu_t \dots \dots \dots (2)$$

Where LPROD remains the dependent variable. X' contains vectors of individual characteristics of enterprise owners (such as gender, educational level). Z' contains vectors of enterprise characteristics (such as size, years of operation, location and access to credit, wage, etc.) and  $\mu_t$  is the error term. A simple Ordinary Least Square regression is employed to estimate determinants of labor productivity. This helps to determine the factors that significantly influence productivity. It also helps in comparing the two sectors in terms of which is more labor productive; by generating a dummy that would tell the difference, if any, in the productivity of service and manufacturing firms. We tested for multicollinearity to determine the degree to which the variables are correlated. Also, it is important to control for heteroscedasticity which is a common problem with cross-sectional data.

## IV. RESULTS AND DISCUSSION

Appendix 1 is a description of the sample. It demonstrates the total number of firms contained in the dataset and the states in which they can be found. The result of the analysis is presented in table 2. Interpretation of the coefficients is based on the dummy assignments and variable specifications. The result presents thus; the sign of the coefficient of years of enterprise operation (YOP) which is also known as the age of the enterprise is positive which means that a unit increase in a firm's age increases productivity by 0.97%. But this is not significant at the 5% level given that the p-value is greater than 0.05, (p-value, 0.111). This shows that firms' age is not a significant determinant of productivity as younger firms may be just as productive as older firms or even more. The sign of the coefficient for the variable, sex, interprets that male-headed enterprises are on average less productive than female-headed enterprises by approximately 3%. However, this result is also not significant (p-value, 0.849). This shows that the level of productivity of firm workers is not determined by the gender of the firm's head. Location represented by proximity to market, 1 if the firm is in an export zone, 2 if in an industrial zone, and 0 if the firm is located in neither industrial nor exporting zones. The result presented shows the signs of the coefficients to be negative; firms located in an exporting zone are less productive than firms located in neither industrial nor exporting zones by 1.03%. Firms in an industrial zone have a lower level of productivity than those located outside the industrial zone by 13.75%. These results do not conform to a priori expectations and are not statistically significant (p-values, 0.968 and 0.298).

### INSERT TABLE 2 HERE

The negative result of the industrial zone and the level of productivity could be as a result of the data collected, as there could be selection bias in the data collection process. Its insignificant nature also supports this claim. The coefficients of the variable, education are statistically significant and the signs are positive for all categories. The result shows that firms whose managers obtained primary education have increased productivity by 78% than firms whose managers are not educated; firms whose managers obtained secondary education have increased productivity by 101% than those whose managers are not educated. Firms whose managers obtained vocational training are more productive than firms whose managers are not educated by 94%. Firms whose managers obtained tertiary education of any sort have increased productivity by 116% over those with no form of education. From the result, an increase in firm head's level of education, on average, increases productivity by 97.25%. This goes to affirm

that formal training is a positive determinant of productivity. Access to Credit was used as an independent variable in explaining labor productivity. The sign of the coefficient shows that if firms had in the last three years collected loans from a bank or any other financial institution, such firm would have higher labor productivity by 11.2% than firms that have not collected any of such loans. This variable although positive is insignificant (p-value 0.614), this could be because loans collected are an addition to capital and not an addition to labor output. This variable may have been significant if the productivity measure was not based on a partial measure of productivity.

From the sign of the variable tech, technology is a positive determinant of productivity. The result shows that enterprises that have technological affiliation with another enterprise are more productive than those without. The result presents that enterprises with a technological license from a foreign country were found to be more productive by 86% than enterprises without a license, and this was found to be statistically significant (p-value, 0.015). The signs of the coefficients of the variable size are unexpectedly negative. According to the classification, medium-sized firms are less productive than smaller firms by 41% and it is statistically significant (p-value 0.024). Large firms are less productive than smaller ones by 94% but this was found to be statistically insignificant (p-value 0.150) meaning there is no significant difference between the productivity of medium and large firms. The firm sector variable describes the productivity of manufacturing firms to service firms. The sign of its coefficient shows that on average, manufacturing firms are less productive in relation to the service firms by about 10%. The p-value presents this variable as insignificant (p-value 0.33).

The sign of the coefficient of wage is positive and the p-value (p-value 0.000) shows that it is a statistically significant determinant of productivity. A percentage increase in a worker's wage would increase productivity by 14%. This supports theoretical and a priori expectation, as the wage is a major determinant of an average worker's input into the production process, which goes along. From the result; wage, size, technology, educational level of the firm head are all significant, therefore statistically significant in explaining productivity. It is important to state here that the insignificance of some parameters may be due to the measure of productivity used and data limitations, they may not matter so much in explaining labor productivity as much as they would for total factor productivity. The parameter  $\beta_5$  which is the coefficient of access to credit may have been significant if a complete measure of productivity had been employed.

It is important to check for some assumptions of the econometrics method of analysis, which may have been violated. The assumptions

tested include multicollinearity and heteroskedasticity. The test for multicollinearity is used to denote the presence of a linear relationship among the explanatory variables.

Multicollinearity is not a condition that either exists or does not exist, rather it is a phenomenon naturally existent in economic relationships due to the magnitude of the relationship. This study employed the Variance Inflation Factor VIF to test for multicollinearity. Decision Rule: if the mean VIF is equal to one, there is no multicollinearity. If within the range of one to five ( $1 < VIF < 5$ ), there is multicollinearity but not with a serious threat. If within the range of six to ten ( $6 > VIF < 10$ ), there is high multicollinearity and could be tested using other tests of multicollinearity. But, if the VIF is ten and above ( $\geq 10$ ) there is a serious threat of multicollinearity, and variables with higher VIFs should be removed, or combined.

As indicated by the result reported in table 4, there exists a reasonable level of multicollinearity among the variables used. The mean VIF is 5.95 which is below 10 means that the level of multicollinearity is acceptable. Heteroscedasticity is a problem inherent in most cross-sectional data analyses such as this. This arises due to the fact that some firms are productive while others are not. The robust option was included in the regression equation using the STATA software which helped to correct the potential problem of heteroscedasticity. To test the working hypotheses of this study; they will be examined one after the other.

### INSERT TABLE 3 HERE

Decision Rule: To accept or reject the hypotheses, the decision rule previously adopted prevails; whereby, if the probability value of the coefficient of interest is greater than 0.05 the null hypothesis will be rejected.

**H<sub>0</sub>**: the manufacturing sector is not more productive than the service sector

**H<sub>1</sub>**: the manufacturing sector is more productive than the service sector

The variable firm sector indicates that firms in the service sector are more productive than those in manufacturing. From the analysis, the service sector was a benched category and from the result, the manufacturing sector was less productive than the service sector by 10% but this result was found to be statistically insignificant. Therefore, the null hypothesis will not be rejected. This means there is no significant difference between productivity in the two sectors.

**H<sub>0</sub>**: firm characteristics do not affect firm productivity

**H<sub>1</sub>**: firm characteristics affect firm productivity

Firm characteristics; wage and size, were statistically significant. The result of the analysis reveals that wage is a statistically significant positive determinant of productivity and this conforms to a priori expectation. The result also presents size as a

significant determinant but it explains productivity negatively. Therefore, the null hypothesis will be rejected and the conclusion is that firm characteristics do affect firm productivity.

### A. Discussion of Results

From the result of the analysis, there are certain deviations from what is expected judging from the literature reviewed. The variable YOP is found positive which is expected but it is insignificant, implying that younger firms may be just as productive as older ones. Judging from works like that of Nagler and Naude (2014), older firms are more productive than younger ones. But the positive sign of the coefficient certainly asserts that an increase in a firm's age contributes positively to its productivity. The variable sex indicates that in the case of Nigerian firms, male-headed enterprises are less productive than female-headed ones. This variable was found to be insignificant which means there is no statistical difference in the gender of enterprise heads with regards to productivity. It is important to state here that female participation in non-farm enterprises which has been found to be low is gradually on the rise, the sector is sizeable and particularly important for women (Nagler and Naude 2014; Loening *et al.* 2008), these enterprises from prior examinations have been found to be less productive in comparison to male-headed ones, but when female education increases it reflects positively on productivity (Heshmati and Rashidghalam 2016).

The variable location was found to be negative for all categories although they were all insignificant. The classification went thus; export zone 1, industrial zone 2; the result presented shows that firms located in an exporting zone and those in an industrial zone are less productive than those located in neither zone. This could be due to the increased competition from exporters and other market participants respectively and their inability to match the competition. The work of Nagler and Naude (2014) posit that location matters for firm productivity and enterprises clustered together benefit from knowledge and technology spillovers and tend to be more productive because of increased competition. The variable education presents positive results for all categories and they were all statistically significant. This confirms that the educational level of the firm head is a significant determinant of productivity and an increase in educational level affects productivity positively. As the head of the enterprise advances in knowledge, it increases his productivity. It has been identified by Costa and Rijkers (2012) that the female participation rate is low and female firms are less productive, but it was also found that an increase in female education increases productivity (Heshmati and Rashidghalam 2016). Furthermore, the significance of this variable affirms that formal training significantly contributes

to productivity as Sala and Silva (2011), therefore vocational training should be encouraged in firms.

The variable ACC which means access to credit presents that productivity is influenced by the firm's access to finance. The insignificant nature of this variable could be as a result of the measure of productivity derived, following extant literature, a firm's access to finance affects productivity and serves as an addition to capital. The variable technology was found positive and significant for enterprises that have technological licenses from foreign companies. In this era of globalization, it is necessary for any enterprise aiming to be productive to tap into the benefits available in technology and innovation. The variable size presents that bigger firms are less productive than smaller ones. The result presented shows that size is statistically significant in determining productivity. The result, however, does not meet a prior expectation because prior findings posit that bigger firms are more productive than younger ones. In this case, it presents that for Nigerian firms, smaller enterprises are more productive than bigger ones. This finding corroborates with that of Okoye *et al.* (2008) where they discovered that farm size and household size were negative determinants of labor productivity. This means that while the size is a significant determinant of labor productivity, for Nigerian enterprises the smaller the size, the higher the productivity. More importantly, the result strengthens the theoretical literature of marginal productivity because as the firm expands, the marginal contribution of an additional worker is less than that of the one before. For a start-up, the marginal contribution may be positive, but only to a point whereby diminishing returns set in, and as the firm grows in size, marginal productivity decreases.

The variable, firm sector presents that firms in the manufacturing sector are less productive than firms in the service sector. This was however not statistically significant. This implies that although service firms are more productive, it does not result from them being in the service sector but could be a result of other latent variables captured by the error term such as the manager-employee relationship which was not captured by the data. In this study, the service sector was found to be more productive than the manufacturing sector but the result was statistically insignificant but there exists a positive correlation between the two sectors, as the work of Arnold *et al.* (2006) confirms.

### V. CONCLUSION

This study analyzed productivity in Nigerian service and manufacturing firms for a total of 1,999 firms across Nigeria. A cross-sectional data from The World Bank was employed to analyze productivity levels of firms and determine factors that influence productivity. A partial measure of productivity which

is the ratio of output to the number of workers was used.

In order to analyze the productivity of the firms in the service and manufacturing sectors, this research work adopted labor productivity to measure productivity using the microdata provided by the World Bank from The World Bank Enterprise Survey on Nigeria. Estimating labor productivity as the ratio of total sales in the last fiscal year to the total number of full-time employees in the last fiscal year, labor productivity was determined for a total of 1,999 firms. In addition to analyzing productivity for manufacturing and service firms in Nigeria, this work sought to identify determinants of productivity by analyzing some factors and the level to which they affected labor productivity. Such factors are; the age of enterprise, size, location, technology; age, gender, educational level of enterprise head; wages, etc. These factors may be grouped into firm-specific characteristics and firm owner characteristics. Wage and size are the main characteristics/factors of productivity. From the result presented, variables such as wage and educational level of enterprise heads were found to be positive determinants of labor productivity and statistically significant in explaining productivity. The firm's access to credit was also positive in determining productivity although it was found to be insignificant which could have been as a result of the productivity measure employed. The size was unexpectedly a negative determinant of productivity. From some of the literature reviewed, it was expected that size would explain productivity positively but the result realized, solidifies the postulations of the classical marginal productivity theory. For smaller-sized firms' productivity was found to be positive. Location of the firm also mattered for labor productivity as different results were witnessed for firms in a different location. Enterprises that were closer to exporting zones were found to be more productive than enterprises not in an export zone. Judging from extant literature, the gender of the top manager or the owner of the enterprise determines productivity. But, contrary to previous knowledge, male-headed enterprises were found to be on average less productive than female-headed ones but this variable was not significant. Technology is another positive determinant of productivity and it was found to be statistically significant.

To a growing economy like Nigeria, productivity is vital in promoting growth and development. It helps raise the standard of living and enhances welfare levels. The issue of promoting diversification is necessary but not sufficient for economic growth; rather increase in productivity and not just output is required for a stable and self-sustaining level of economic growth. From the findings of this work, it was observed that productivity matters; it measures the performance of firms operating in the economy. It is therefore

important to make policies that will not only improve but also encourage productivity in firms. To increase productivity, the following recommendations are made:

- Government should set policies to arouse productivity in enterprises. A firm's productivity would increase competitiveness in the international market. Policies should also aim at promoting trade openness which would raise competitiveness.
- Firms that are productive should be granted subsidies and other incentives like tax holidays or direct aid. This will ensure that the existing firms that are productive benefit directly from the government and are commended for their positive contributions. This could spur other firms to aim at increasing their productivity levels.
- Firms should also encourage productivity among their workers. Productive workers should be rewarded directly and not as a collective effort as seen in most Nigerian firms. Commendation and added benefits granted to such workers would spur others to aim at increased productivity. Additionally, non-productive workers could be relieved of duty. This latter action may seem extreme but it really is for the greater good of the firm in particular and the economy as a whole. From the result of the analysis, size was found to be a negative but significant determinant of labor productivity which could mean that Nigerian firms have many workers operating at low productivity levels, therefore, it is important to maintain a sizeable number of employees such that each marginal return is equal to the marginal expenditure.
- Firms that wish to promote productivity can engage their workers in vocational training, seminars, and workshops. Promoting a healthy working environment goes a long way to encourage productivity at the firm level. Training has been identified to be important in explaining productivity.

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## APPENDICES

### Appendix 1: Description of the sample

Sampling Region	Freq.	Percent	Cum.
Abia	125	4.67	4.67
Abuja	152	5.68	10.35
Anambra	149	5.57	15.92
Cross river	136	5.08	21.00
Enugu	125	4.67	25.67
Kaduna	139	5.19	30.87
Kano	195	7.29	38.15
Lagos	281	10.50	48.65
Oyo	119	4.45	53.10
Gombe	126	4.71	57.81
Jigawa	123	4.60	62.41
Katsina	125	4.67	67.08
Kebbi	131	4.90	71.97
Kwara	124	4.63	76.61
Nasarawa	130	4.86	81.46
Niger	125	4.67	86.14
Ogun	130	4.86	90.99
Sokoto	118	4.41	95.40
Zamfara	123	4.60	100.00
Total	2,676	100.00	

### Appendix 2: Variable Specification

1. SEX; 1 if male, 0 otherwise.
2. Firm sector; 1 if the firm is in service, 2 if in manufacturing.
3. Location; 1 if an enterprise is in an export zone, 2 if the firm is in an industrial zone and 0 otherwise.
4. Education; 1 if firm head received no education, 2 if he attained primary education, 3 if he attained secondary education, 4 if he obtained vocational training, 5 if he attained tertiary education.
5. Access to Credit; 1 if the firm had access to credit (in this case had received any loan in the last three years), 0 otherwise.
6. Size; 1 for small firms ( $n \leq 20$ ), 2 for medium firms ( $20 < n \leq 100$ ), 3 for large firms ( $n > 100$ )
7. Technology; 1 if a firm had the technological license, 0 otherwise.
8. Wage; non-dummy, the monthly remuneration to a worker. (lineage is the natural log of the wage).
9. Years of operation; non-dummy, measures firm's age.