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AN ASSESSMENT OF THE RELATIONSHIPS BETWEEN POPULATION DENSITY AND LABOUR PRODUCTIVITY OF DEPOSIT MONEY BANKS IN NORTHWESTERN NIGERIA

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Abstract

The striking disparity in terms of growth between the real sector and the money sector has attracted the attention of various researchers on why such disparityexists. In Nigeria, the banking sector is by far the fastest-growing compared to that of production. Ideally, all the capital generated by banks supposed to be not only exhausted but also utilized by the manufacturing industry that is not the case in Nigeria. Apart from growing faster than the real sector, the banking sector provides employment to the teaming population more than the real sector. It is believed that the concentration of population gives room for more labour productivity of the deposit money banks (DMBs). This study investigated the existence of disparity or otherwise in terms of labour productivity of the banks located indensely populated areas and those located in sparsely populated areas ofNorthwestern Nigeria. The study utilized Ordinary Least Square (OLS) on a log-linear model, derived from Cobb-Douglas production function, combined with a dummy variable. The result shows that the labour productivity of the DMBs located in densely populated areas is higher than those located in sparsely populated areas. The study recommends the concentration of DMBs in densely populated areas for more labour productivity.

Keywords: Deposit Money Banks, Labour, Northwestern Nigeria, Population, Productivity.

1. Introduction

High rates of crime, insecurity, and insurgency are consequences of poverty,and they are obstacles to economic growth and development attainment (Danlami, Hidthiir& Hassan, 2018). A nation with absolute intention to register meaningful progress in terms of economic growth must develop the surest way of mitigating absolute poverty for the purpose of reducing criminal activities and security provision in the nation. Tsauni (2013) pointed out that the easiest way of withering away impoverishment and high rate of poverty is through continuous improvements in productivity,whichis the key to higher economic growth attainment. Productivity improvement is vital as it provides more commodities, in terms of goods and services, to customers, users,and consumers. This, at the same time, translates into a higher profit to producers and in turn, leads to more employment consequent to a reduction in both poverty and unemployment rates.

Nigeria is one of the countries located in West Africa, a member of the commonwealth; it is the most populous country in the continent and sixth most populous country in the world. The country is struggling to develop and reduce the high rate of poverty among its populace. Also, imbalance growth has been witnessed between the real sector and the money sector in the country. The noticeable disparities in terms of growth between the real sector and the money sector have attracted the attention of various researchers on the reasons for the existence of such disparities. In Nigeria, the banking sector is by far the fastest-growing compared with that of production. Ideally, all the capital generated by banks supposed to be not only exhausted but also utilized by the manufacturing industries (borrow the capital and payback both principal and interest at an agreed time as well as make a profit) (Craig, 1997). Therefore, growth and expansion of the real sector are expected to be ahead of that of the banking

sector, because the latter depends on the performance of the former to succeed and flourish. This is not the case in Nigeria. Hence there is a need to investigate the drivers of productivity in the banking industry.

The drivers of productivity (labour-based) of the Nigerian Banking sector have been identified to be; a number of workers and deposit value (Danlami, 2017a), in addition to this, branches with stronginter-branch connectivity are recognized to have higher labour productivity than those with slow inter-branch connectivity (Danlami, 2017b). Tong and Wong (1997) pointed out the advantages that countries, like Nigeria, with high population, have over those with densely population as; having large market finished products, more support,and social contact, good aid facilities, better employment opportunities,and high productivity. This research investigates, empirically, the difference between the level of productivity of Deposit Money Banks (DMBs) in densely and sparsely populated area of Northwestern Nigeria. The rest of the paper consists of the literature review,which is in section two and the research methodology,and the theoretical framework are in section three. Section four and five presents the findings and conclusion of the study respectively.

2. Literature Review

2.1 Conceptual Review

The term productivity is defined in many ways, unanimously it is referred to as average productivity or average product, as it is the total output (quantity or value) that is being divided by the total input (both labour and capital) (Danlami, Hidthiir& Hassan, 2018; Tsauni, 2013; Krugman, 1992). When the contribution of either labour or capital is measured, the total output is being divided by either labour; to measure the labour productivity or capital; to measure the productivity per unit ofcapital. Productivity can be physically tangible if it is for goods or physically intangible if it is for services. Danlami (2017b) maintained that services sector productivity is of different kinds, depending on the nature of the services rendered, for example, services rendered by airplane is transporting passengers and their goods from one place to another. While a number of patients treated by a medical doctor could be used as his productivity and the percentage of a target achieved by a consumer banker could be used as his productivity.In a simple language, the term Population Density is the concentration of people within specific vicinity. Population Density could be high or low depending on the nature of concentration of the individuals in the specific area. Deposit Money Banks are simply the commercial banks that facilitate the financial intermediation with the country.

2.2 Empirical Review

There are a number of studies on the effect of population and population density on productivity, but the majority of them concentrated on the productivity of the goods sector, given lesser attention to the services sector. For instant, Abel, Dey and Gabe (2012) investigated the effect of population density on the productivity of the United States (the U.S) metropolitan areas using Ordinary Least Squares (OLS). The study discovered a positive influence of the population density on productivity as doubling the density results in almost four percent increase in productivity. In another research, Moses, Mullen and Powel (2014) conducted a study with the aim of assessing the impact of an aging population on states productivity in particular, and economic growth in general, in the U.S. The study utilized OLS and discovered an inverse effect of an aging population on both productivity and economic growth.

Furthermore, Josephson, Ricker-Gilbert and Florax (2014) investigated the effect of rural population density (RPD) on agricultural productivity in Ethiopia. The result of the panel study reveals a negativeeffect of the population density on the agricultural productivity in the rural areas. Feyrer (2007) carried out a studyfor the purpose of analyzing the effect of workforce demography and population density on the productivity of the Organizations for Economic Co-operation and Development member countries. The panel study reveals the existence of a positive effect of population density on productivity. A similar finding is reported by a study conducted on the same OECD member countries by Galor and Mountford (2008).

Nevertheless, Luck (2007) conducted researchwith the

aim of evaluating the relationships among population density, net primary productivity, species richness,and land use in Australia. The study utilizes correlations and spatial regressions. The results show that productivity increases with the increase in population density, but after some time as the population becomes denser, the nature of the relationships change to negative, hence concludes that their relationship is not-linear. Also, Muyanga and Jayne (2014) carried out research to measure the effect of population density on agricultural productivity based on land intensity in Kenya. Their discovery made them declare the relationship as non-linear as a threshold exist by which from it, an increase in the population density reduces productivity while below the threshold population density increment increases the productivity. A similar study is conducted, and findings are reported by Ricker-Gilbert, Jumbe and Chamberlin (2014) in Kenya.

Moreover, Morikawa (2011) conducted a study with the aim of empirically investigating the determinants of services industry productivity in Japan. The study reveals that; productivity increases with an increase in the population density. Also, Beaudry, Collard and Green (2005) analyzed the effect of population density on productivity across various developed and developing nations. They conducted their analysis based on the belief that countries passed-through technological transitions, and some are still in the process. To them, the fastest adjusting countries that are ahead of the slower adjusting countries have such advantages due to labour growth emanating from high population density that they have, consequent to having higher productivity as well.

In his investigations, Peterson (2017) maintained that there is no unidirectional nature of the effect or relationship between population density/growth and productivity/economic growth. To him, the low population growth in high-income countries likely to create social and economic problems due to low productivity. While high population growth in low-income countries may slow their development, he added that; international migration -that could help to adjust the imbalance is opposed by many nations. Hence, he concludes that the low/high population growth in high-income/low-income countries and limited migration will contribute to increase national and global economic inequality. Similarly, Sinding (2009) conducted a research to analyze the effect of population growth on productivity and economic growth in Sub-Saharan Africa. He stressed the need for population control to be in-cooperated in the countries' economic development strategies, as he finds it to be adversely affecting the countries' productivity.

Also, Maestas, Mullen and Powell (2016) conducted a study with the aim of investigating the effect of the aging population on productivity, economic growth, and labour force in the U.S states. They reported in their findings that an increase in aging population reduces productivity in particular, and at the same time, it reduces the level of economic growth in general. In a similar vein, Liu and Westelius (2016) conducted a study with the aim of examining the impact of demography on productivity and inflation in Japan. They reported in their findings that population growth, which increases aging population reduces Japan's productivity, whereas, the population growth, which increases the working-age population increases productivity.

The review of the related literature reveals the existence of inconsistency in terms of the findings of the previous studies on the effect of population density on productivity. The combination of both linear positive and linear negative relationships was reported by various studies, whereas, some studies reported a non-linear type of relationship. For example, Abel, Dey and Gabe (2012), Morikawa (2011), Beaudry, Collard and Green (2005), Feyrer (2007) and Galor and Mountford (2008) reported positive relationship in their findings. Whereas, Maestas, Mullen and Powell (2014), Josephson, Ricker-Gilbert and Florax (2014), Sinding (2009), and Maestas, Mullen and Powell (2016) reported negative relationship in their findings. A non-linear relationship was reported by Luck (2007), Muyanga and Jayne (2014), Ricker-Gilbert, Jumbeand Chamberlin (2014), and Liu and Westelius (2016). Therefore, a study in one area cannot be generalized, without empirical evidence, to other areas.

3. Methodology

In this section, the methods utilized in conducting the research are discussed. It started with a theoretical framework which provides the theoretical backing of the study, followed by the method of estimation and data source. The section concluded with the definition of the variables of the study.

3.1 Theoretical Framework: The Production process is the ways of converting the input into output, as explained by the theory of production. Therefore, to the theory, the total quantity of output produced is beingdetermined by the number of inputs utilized. Such inputs include a number of workers (labour), capital, and raw materials. The number of workers that are available to work is constraints by many things, including the population density, which in turn could affect the productivity of a firm. This study it basis form theory of production and derived its variable from the famous Cobb-Douglas production function as follows:

$Q = \beta_0 L^{\beta_1} K^{\beta_2}$ ……[1]

Where Q is the total product, ß$_0$ is constant, L is labour, and K is Capital

The contribution of labour or average productivity of labouris normallybeing calculated by dividing the total output by the number of workers. Hence Equation [1] is divided through by Las:

$\frac{Q}{L} = \frac{\beta_0 L^{\beta_1} K^{\beta_2}}{L}$ ……[2]

Set $\frac{Q}{L} = Q^*$ and also take the log of both sides we have:

$logQ^* = \log\left(\frac{\beta_0 L^{\beta_1} K^{\beta_2}}{L}\right)$ ……[3]

Applying the law of logarithm then:

$logQ^* = log\beta_0 + \beta_1 logL + \beta_2 LogK - logL$ … [4]

$logQ^* = log\beta_0 + (\beta_1 - 1)\, logL + \beta_2 LogK$ …[5]

Set: $log\beta_0 = a_0$, and $(\beta_1 - 1) = a_1$, then

$logQ^* = a_0 + a_1\, logL + \beta_2 LogK$ [6]

Equation [6] is the linearized Cobb-Douglas production function, and when a dummy variable and its coefficientis added to the model, we get the final equation of the model as:

$logQ^* = a_0 + a_1\, logL + \beta_2 LogK + \beta_3 D_L + \varepsilon$. [7]

Where: $logQ^*$ is labour productivity, L is the number of workers, K is capital, DL represent dummy variable with the value of 1 (one) for the densely populated area and 0 (zero) for sparsely populated area., $a_s$and β_s are their coefficient with an expected positive sign, ε is the error term with white noise properties $\varepsilon \sim iid(0, \delta_\varepsilon^2)$ it is expected to be independently and identically distributed with zero mean and constant variance.

3.2 Method of Estimation and Data Source: The study applies Ordinary Least Squares (OLS) to the derived Cobb-Douglas log-linear model combined with a dummy variable to measure the effect of population density of the labour productivity of DMBs in Northwestern Nigeria. The research sourced data primarily with the help of questionnaires using multi-stage sampling. Within the Northwestern states of the country the study purposively selected Kano (because of a high density of population) and Sokoto (because of its high nature of sparsely population) States to distributes its Questionnaires in the new generation banks (Guarantee Trust and Zenith banks) and old generation banks (Union and First banks). The staff of the banks is randomly selected to administer the questionnaires which 256 were distributed,and 100 of them were recovered and used for the analysis,i.e., about 40 percent of the distributed questionnaires were recovered and used for the analysis.

3.3 Definition of Variables of the Study and Their Measurements: The variables utilized by this study include labour production as the dependent variable. The independent variable includesa number of workers, capital, and population density. The concern variable is population density;the rest of the independent variable are control variables. The study is for the banks that provide service (intangible goods) and therefore, percentage of the target achieved by branches are used as their productivity while a number of worker and capital are as their names imply. A dummy variable is used to measure the effect of population density with densely populated area location of a branch as one (1) while sparsely populated area as the location of the branch as zero (0). Their respective coefficients are expected to have less than unity (less than one value) because of the

logarithm transformation, and positive (sign) effect on labour productivity.

4. Resultsand Discussion

This section presents the findings of the study. It started by presenting the descriptive statistics of the variables of the study presented in Table 1 and Table 2, for the continuous variable and dummy variable, respectively.Table 1 shows that all the mean values of the variables lie between the minimum and the maximum, in addition to this, the mean values are higher than their respective standard deviation which implies that the series of each variable are closer to their respective average values and therefore, they could be normally distributed.

Table 1; Descriptive Statistics of the Continuous Variables of the Study

Variables	Mean	Standard Deviation	Minimum	Maximum
LogQ*	1.723	0.207	1.290	1.927
Log L	1.200	0.173	0.845	1.462
Log K	2.614	0.395	1.870	3.470

Note: that the variables are in logarithm form as per the requirement of the log-linear model
Source: Authors' computation using stata14 (2021)

The dummy variable descriptive statistics is presented in Table 2. The table indicates that 78 percent of the respondents' bank branches are located in densely populated areas, whereas 22 percent of the bank branches are located in sparsely populated areas.

Table 2; Descriptive Statistics of the Dummy Variable of the Study

Type	Code	Frequency	Percentage	Cumulative Frequency
Densely Population	1	78	78	78
Sparsely Population	0	22	22	100

Source: Authors' computation using stata14 (2021)

Table 3 presents the regression results of the estimation, though it could not scale through heteroskedasticity test as the estimation has heteroskedasticity problem. Hence solution must be sought through the estimation of robust regression.

Table 3; Result of Regression

Variables	Coefficient	Std. Error	*t*-Statistics	Probability
Log L	0.672***	0.085	7.880	0.000
Log K	0.123***	0.041	3.030	0.003
D_L	0.112***	0.022	5.000	0.000
_cons	0.509***	0.052	9.760	0.000

*Note that *** represents significant at one percent level*
Source: Authors' computation using stata 14 (2021)

Heteroskedasticity Tests: The errors term series of the estimated model are heteroskedastic as against the desired homoskedastic,as shown by Breusch-Pagan tests. The probabilities of the tests are less than five percent each, as presented in Table 4.

Table 4; Results of Heteroskedasticity Test

Stata Command	Chi-Square	Probability
Hottest	25.71	0.0000
hettest, iid	14.67	0.0000

Source: Authors' computation using stata14 (2021)

The results of the heteroskedasticity tests necessitated the re-estimation of the regression using a robust command to mitigate the identified problem, this has been done,and the result is presented in Table 5. The table shows that the size of the coefficients is the same,but the problem of the heteroskedasticity underestimated the standard error and therefore overestimated the *t*-Statistics, which if not corrected, could be miss-leading. The corrected robust regression presented shows the corrected standard errors and *t*-Statistics/probability as well, therefore, all the analyses are based on the following estimation.

Table 5; Result of Robust Regression

Variables	Coefficient	Std. Error	*t*-Statistics	Probability
Log L	0.672***	0.092	7.270	0.000
Log K	0.123**	0.048	2.540	0.013
D_L	0.112***	0.036	3.080	0.003
_cons	0.509***	0.065	7.820	0.000

*Note that *** and ** represents significant at one percent and five percent levels, respectively*
Source: Authors' computation using stata 14 (2021)

Multicollinearity Test: Variance Inflation Factor (VIF) test is conducted, the result shows that there is no problem of multicollinearity as none of the VIF coefficient is up to 10 in value as shown in Table 6.

Table 6; Result of Multicollinearity-VIF Test

Variables	VIF	1/VIF
Log K	7.040	0.142
Log L	5.980	0.167
D_L	2.380	0.421

Source: Authors' computation using stata14 (2021)

Joint Statistics Significant (F) Test: F- Test conducted indicated that all the variables are jointly influencing the labour productivity with probability less than five percent and are, therefore, retained for further analysis, as presented in Table 7.

Table 7; Results of Joint Significant Test

Stata Command	F-Statistics	Probability
TsestlogL=logK=ddns	12.03	0.0000

Source: Authors' computation using stata14 (2021)

Normality of the Error Terms: For the purpose of checking the normality of the error term, the error term seriesare plottedalong with the normal density,and it is presented in figure 1 below:

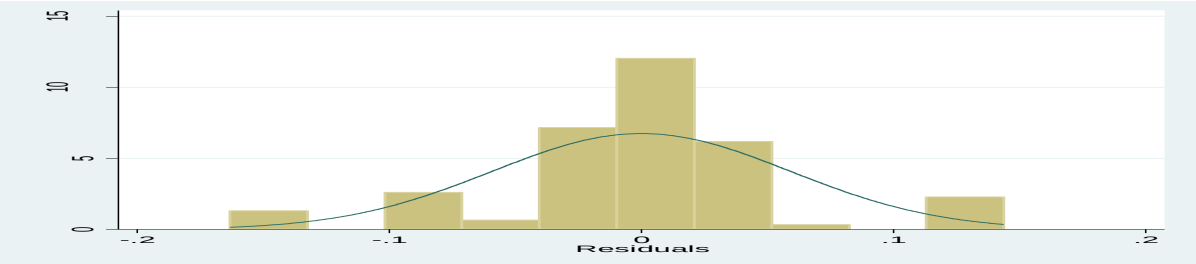

Figure 1; Normality Sketch of the Error term.

Discussion of Findings

A log-linear model, derived from Cobb-Douglas production function, combined with a dummy, was estimated using OLS for the purpose of investigating the existence of disparity or otherwise between DMBs productivity in a densely and sparsely populated area. The estimated model is robust to heteroskedasticity, and there is no multicollinearity problem. Furthermore, joint *f*-Statistics test signifies that the variables are good for the model. On the basis of these, the findings of the study are:

*Effect of Densely Population on DMBs Productivity:*The results of the estimation show that there exists a disparity between the DMBs labour productivity of a branch located in a densely populated area with that of the branch located in a sparsely populated area. The coefficient of 0.112 implies that labour productivity in a densely populated area is higher, with 11.2 percent than that of the sparsely populated area, and it is significant at one percent level. This finding is in accord with that of Abel, Dey and Gabe (2012) and Morikawa (2011) but their study is on the productivity of tangible commodities, not services.

Number of Workers: This is one of the control variables in this study, but it is important and significant in explaining the changes in labour productivity in DMBs in Northwestern Nigeria. The coefficient 0.672 implies that doubling the number of workers in a branch will result in an increase in the labour productivity of that branch by 67.2 percent,and it is significant at one percent level. This study is in conformity with the findings of Danlami (2017a; 2017b).

Capital: As one of the important and control variables, the coefficient of capital is significant in explaining the changes in the DMBs labour productivity in Northwestern Nigeria. The coefficient value is 0.123 implies that doubling the branch's capital will lead to an increase in labour productivity by 12.3 percent,and it is significant at afive percent level. The findings are in accord with that of Danlami (2017a; 2017b).

5. Conclusion and Recommendations

This study is on the investigation of the existence of disparities between labour productivity in densely populated areas and that of sparsely populated areas of DMBs branches in Northwestern Nigeria. A log-linear model combined with dummy variable was estimated using OLSon data generated primarilyfor this study, and the results show that labour productivity is higher in the bank branches that are located in densely populated areas than those located in sparsely populated areas. The research recommends the concentration of bank branches in densely populated areas as they have more labour productivity.

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