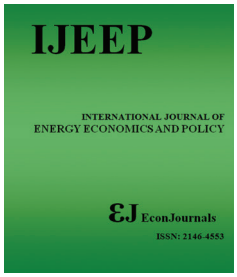

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Electricity Consumption and Human Capital Development in Nigeria: Exploring the Implications for Economic Growth

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ABSTRACT

This study examined the multiplier effect of human capital development through the usage of electricity power for maximum productivity to enhance economic growth in Nigeria. The study engaged data sourced from the World Development Indicators for the period 1981-2016, and the fully modified ordinary least squares econometric method was engaged for the analysis. Results from the study showed that, human capital development is insignificantly related to the economic growth in Nigeria, while electricity consumption is significantly linked with economic growth. Therefore, the study recommended that there is a need for the government to develop human capital via the improvement of the educational and health facilities in the country as well as provide electricity in the rural and urban areas for maximum productivity.

Keywords: Human Capital, Electricity Consumption, Economic Growth
JEL Classifications: F63, I15, I25, L94

1. INTRODUCTION

The demand and the use of energy globally have been on the increase for the past two decades, because of its vital place and usefulness in the improvement of human capital development and the global economic growth (Matthew et al., 2018; Zhange et al., 2017; Lin and Lin, 2011). Developing countries are increasing their level of economic growth through the use of energy such as electricity amongst others. The growth in the population rate and urbanisation has become the major driver of the world's energy consumption (Suganthi and Samuel, 2012; Babajide et al., 2015; Raza et al., 2016; Nain et al., 2017).

Conversely, the increasing use of energy, especially electricity and other non-renewable energy in a large proportion has resulted to the accumulation of greenhouse gases to the atmosphere which has affected human health and led to environmental pollution and ecological damage on a large scale (Alege et al., 2017; Matthew et al., 2018). High electricity consumption that enables the progress of human capital is required for the economic development of any country (Fang and Chang, 2016). In recent years, countries have deliberated on healthier and sustainable energy sources (at the core of the November 2016 Paris Climate Summit) because distinct is the stylized fact that energy is central to economic growth (from industrial revolution). Developing countries must look into the challenge of electricity shortages owing to the fact that developed countries have in times past sorted the issue of inadequate electricity generation; they have now transited to the issue of cleaner sustainable energy sources and the knowledge economy (Fang and Chang, 2016; Alege et al., 2017).

Human capital comprises of education and health components at the very basic level (Matthew, 2011). Matthew (2011) defined human capital as health and education which are two intertwined components mutually necessary to make human beings more

productive. Similarly, Van Leeuwen (2007) defined human capital as a formal and an informal education without forgetting other related and natural occurrences for instance the expenses involved in raising children, health costs and skill (in other words, factors that help capital; education and health).

Again, Appleton and Teal (1998) defined human capital as a wide idea that sees human capacities whether inherent or learned that can lead to increase in income. With respect to the study of Appleton and Teal (1998), the explanation of Todaro and Smith (2003) was adopted in this study. Ejemeyovwi et al., 2018; Todaro and Smith (1998) posited that human capital is human capacities that raise the productivity of a country when used efficiently in terms of education and health and electricity and ICTs usage will help achieve this through good institutional framework. Investing in any business (human capital inclusive) in today's world necessitates doing a SWOT analysis (that is, finding out the strengths, weaknesses, opportunities and threats) of the business before its commencement. This makes the business to be enduring and withstand the test of times (Ajibade et al., 2016).

Electricity as a source of energy is a vital infrastructure needed for daily living in relation to human capital; electricity is one of the three top issues mentioned by youths in developing countries along with employment amongst others (Matthew, 2011). Electricity enables human capacity in areas such as the boiling of water, watching the television as well as getting access to the internet for daily information and environmental awareness. It also enables education across borders using the technology platform, enables life saving surgeries and the working of high technological hospital equipment to cure advanced diseases and also life support machines amongst many others (Jahan, 2000). Electricity in its usefulness and applicability, is directly needed in industries in the production of output, existing industries in Nigeria complain of inadequate electricity supply to power their machines and technologies to produce physical goods, without electricity or in general energy sources, human capacities in the area of physical products remain just ideas crediting Solow model which listed the core components of growth as capital, labour and technological progress under which electricity falls (Matthew, 2010; Adeniran et al., 2018; Osuma et al., 2018; Akintoye et al., 2013; Banuso, 2013; Alege and Osabuohien, 2015; Jahan, 2000; Osabuohien et al., 2018).

This study is built on the argument that, as observed in literature and following the study of (Jahan, 2000). Globally, approximately 1.2 billion individuals have limited access to electricity, out of these people, about 2.8 billion depend on solid fuel, like wood, coal, and charcoal as an alternative source of energy, these alternative sources of energy have caused noxious indoor air pollution for cooking. The United Nations sustainability of energy has three goals for 2030 which are; to attain worldwide admittance to cleaner energy, ensure energy supply adequacy, and increment in the proportion of renewable energy in the international energy mix. To the best of the knowledge of the authors, studies with respect to the growth of the Nigerian economy through the development of human capital induced by electricity consumption has not been carried out, thus; this study contributed to the frontiers of knowledge by filling this gap.

Therefore, this study examined how economic growth of Nigeria will be achieved through the development of human capital induced by electricity consumption. The study comprises of five sections; following this introductory section is section two which presents some insights from empirical literature. Section three unveils the method engaged in the study; section four discusses the empirical analysis of the results and findings of the study; section five concludes the study by recommending policies that will help turn around the issues associated with electricity consumption in developing human capital so as to attain the required growth rate in the Nigerian economy.

2. LITERATURE REVIEW

The discovery and utilization of energy have immensely enhanced the expansion of the world's economy and the continuous progress of the human society (Oyedepo, 2012). According to Oluwatobi (2011); Oluwatobi and Olurinola (2011), they ascertained the link between human capital development and the growth of the Nigerian. The studies investigated the impact of government expenditure on education and health and the resultant consequence on economic growth in Nigeria. They used secondary data in the analysis, adopting the Augmented Solow model. These studies posited that there exist a positive correlation between government recurrent expenditure on health and education and the level of production. Conversely, according to Oluwatobi and Olurinola (2011), while government recurrent expenditure is positively related to real output level, government capital expenditure is inversely correlates with economic growth of Nigeria. The studies recommended the proper allocation of capital expenditure funds to education and health infrastructure in order to advance Nigeria's economy. Similar to Oluwatobi and Olurinola (2011), Isola and Alani (2012) carried out a study to examine the role of the various ways of measuring the development of human capital in Nigeria, noting that education and health remains the basis of human capital development. The study of Isola and Alani (2012) engaged secondary data sourced from the Nigeria's Statistical Bulletin of the Central Bank. The result from the study showed that less attention has been paid to health compared to education but both are vital to Nigeria's economic advancement.

Adawo (2011) and Ogujiuba (2017) investigated the link between the role of schooling and the growth of the Nigerian economy. Schooling was proxied by primary school enrolment, secondary and tertiary enrolments, physical capital stock and health have a direct relationship while secondary and tertiary enrolments were found to have an inverse relationship with economic growth in Nigeria respectively. Similar to Ogujiuba (2017) and Adawo (2011), Dauda (2010) examined the importance of human capital development to the Nigerian economy using the endogenous growth theory coined by Mankiw et al. (1992). The study employed the cointegration approach and the error correction mechanism (ECM), the results from the study showed that a response device exists between human capital development and the Nigerian economy.

Akin to Ogujiuba (2017) and Adawo (2011), Amassoma and Nwosa (2011) carried out a study that assessed the causal relationship between investment in human capital and the growth of the Nigerian economy. The study employed Error Correction

Model (ECM) and Granger causality econometric techniques. Result from the study showed that there exists no causality between human capital investment and Nigeria's economic growth. Based on this result, the study recommended that budgetary percentages to the education and health sectors be increased along with the provision of related infrastructures like buildings and supplies to further increase human capital. Another important finding from the study was the issue of labour mis-match prevalent in Nigeria and the need to tackle it for accelerated national growth.

At the micro level, Dethier et al. (2008) used primary data to explain the performance of 55 enterprises in Guatemala, Honduras, Nicaragua and five Eastern European countries where technology infrastructure is a major constraint. The result from this study revealed that electricity is the major constraint to industrial development. The result contradicts the findings of Dollar et al. (2005) who found out from their study that electricity outages have a significantly inverse effect on national output in Bangladesh, China, India and Pakistan. In another study on the role of human capital towards economic development carried out by Hulten et al. (2003), this study focused on the aspect of productivity that will lead to economic growth in India resulting from the development of human capital. The study engaged data from 1972 to 1993. The results showed that increasing electricity generating capacity in one network may have a ripple effect on the entire network of electricity supply, thereby removing constraints to factor productivity. Their work was motivated by the works of Hulten and Schwarb (1993) that argued that if expansion in electricity generating capacity could increase product quality and factors, then economies of scale sets in, competition and specialization increases total factor productivity.

According to Jumbe (2004), he employed the Cointegration and the ECM in examining whether a long run relationship exists between GDP and electricity variables in the Malawian economy between 1970 and 1999. The result from this study revealed that there is a causal and direct relationship existing between electricity consumption and economic growth. He concluded that when the consumption of electricity increases, there will also be a boost in the level of economic growth in Malawi in the long run. Similarly, Odhiambo (2009); Adeola and Aziakpono (2017) carried out a study to investigate how the usage of electricity power will translate to the growth of the South African economy. The method of the trivariate causality was employed, and findings from the study revealed that there is a two-way causality between the usage of electricity power and South Africa's economic growth. In line with that, Akinlo (2009) examined the relationship between electricity power usage and the productivity in real GDP in Nigeria. The result of the study found out that there is a long-run relationship existing between the two afore-mentioned variables, this means that electricity consumption brings about economic growth.

3. THEORETICAL FRAMEWORK AND METHODOLOGY

3.1. Theoretical Framework

Endogenous growth theory formed the basis for this study. The theory assumed that internal factors in an economy such as education and health (human capital) are major determinants of long-run economic growth. According to the endogenous theory, the long run rate of economic growth can be influenced by economic factors such as the innovation mechanism through which technological progress takes place and this could be in respect of new products, processes and for this study cleaner energy sources.

A recent version of the above theory is the "innovation–based" growth theory which takes into cognizance scholarly capital as a source of technical improvement as separation was made between physical and human capital which were accumulated through schooling and saving, and scholarly capital through innovation. This was developed by Mankiw et al. in 1992. Based on the Cobb Douglas production function, in analyzing the necessary components of growth in the form of input-output; the model takes a non-linear form as is the character of time series data, the Cobb Douglas production function takes a modified form to include energy (electricity consumption) along with capital, labour (Bah and Azam, 2017) and also human capital proxies in government expenditure on education and health already supported by Mankiw et al., (1992). The necessary internal forces in the model to cause economic growth are capital, labour, human capital, fixed telephone lines (FXTL) and electricity consumption for this study and is akin to the new endogenous theories (Matthew et al., 2010; Matthew, 2011; Adegboye et al., 2016).

3.2. Methodology

This study adopted the model that explains the determinants of economic growth by Matthew (2011) on human capital development which is in line with theory, dropping the primary school and secondary school enrolment rates with the inclusion of FXTL and electricity power consumption variables as the key explanatory variables in this study. The other explanatory variables are electricity power consumption (elect), gross fixed capital formation (CAP), total labour force (LAB), FXTL, government expenditure on health sector (HEXP) and government expenditure on education (EDEXE), while the dependent variable RGDP (real gross domestic product [GDP]) is used to proxy the growth of the Nigerian economy.

Thus, the model can be stated implicitly as:

$$GDP = f(elect, cap, lab, fxtl, hexp, edexe) \quad (1)$$

Equation (1) can be specified explicitly in a non-linear form as:

$$GDP = elect^{\alpha 1}.cap^{\alpha 2}.\ lab^{\alpha 3}.\ fxtl^{\alpha 4}.\ hexp^{\alpha 5}.\ edexe^{\alpha 6} \quad (2)$$

The study utilised the Cobb Douglas production function, given that a production process (input and output systems) needed for the production of a required output level. Taking the double-log of the variables in order to linearise equation (1), it gives:

$$logGDP = \alpha_1 logelect + \alpha_2 loglab + \alpha_3 logcap + \alpha_4 logfxtl + \alpha_5 loghexp + \alpha_6 logedexe + \varepsilon \quad (3)$$

where: GDP is real GDP; elect is electricity power consumption; cap is gross fixed CAP; lab is total LAB; fxtl is FXTL; hexp

is government HEXP and edexe is government expenditure on education sector.

3.3. Technique of Estimation

This study adopted the technique of estimation as used by Bashier and Siam (2014) where a unit root test is carried out in order to determine the level of stationarity selected variables the Johansen cointegration method was engaged in determining the level of cointegrating equations between the endogenous and the exogenous variables (based on stationarity result), the fully modified ordinary least squares (FMOLS) and the normalized cointegrating coefficients are used to determine the long-run estimates for policy inference. A major assumption of a standard regression analysis is the condition that the variables being tested are stationary. However, many macroeconomic time series variables are often not stationary, they fluctuate over time (Fleegler, 2006). Therefore, before regression analysis can be carried out on time series variables, test for stationarity must be conducted in order to avoid 'bias estimates' or 'spurious results'.

The FMOLS approach generates estimates that are reliable for small sample and gives a check for strength of the estimates. The FMOLS technique was first coined and used by Philips and Hansen (1990) for the estimation simple long-run correlations. The advantage that the FMOLS method has over the Engel and Granger method is because, it leads to an accurate correction to overcome the deduction difficulty in Engel and Granger method and therefore, the t-statistic for the long-run relationship tends to be definite (Himansu and Lester 2007).The FMOLS technique engages the "Kernal" estimators which comprises of nuisance bounds that impact on the asymptotic dissemination of the OLS estimator. To obtain effective asymptotic, this method summarises least squares in controlling for the effect of autocorrelation in the model and test for the endogeneity (Kalim and Shahbaz, 2009). For the determination of the long-run estimates, the FMOLS is employed while to determine the number of cointegrating vectors for any given number of non-stationary variables of the same order, the Johansen cointegration technique could be employed (Bashier and Siam, 2014). The fully modified OLS technique is used to take care of endogeneity and serial correlation while producing optimal long-run co-integrating estimates (Phillips and Hansen, 1990) and is also reliable in the cases of a dataset with having stationarity at levels and first difference.

3.4. Data Source and Measurements

This study used secondary data obtained from the World Development Indicators, and the Statistical Bulletin of the Central Bank of Nigeria (CBN) spanning from 1981 to 2016. The variables include; the RGDP-real GDP as proxy for Nigeria's economic growth, electricity power consumption as the main variable of interest, FXTL, gross fixed CAP, total LAB, and the human capital development is represented by government expenditure on health and education. The variables are defined in Table 1.

4. RESULTS AND DISCUSSION

4.1. Descriptive Analysis

The descriptive analysis showed the features of the data with respect to each variable. The tools utilised are mean, median, maximum, minimum, standard deviation, skewness and kurtosis. Table 2 shows the statistical analysis of the variables - real GDP, electricity power consumption (elect), gross fixed CAP, total LAB, FXTL, government HEXP (hexp) and government expenditure on education sector (edexe). From the results in Table 2, which showed the summary of the dataset for this study, the mean of the GDP has a value of ₦217 billion, the maximum and minimum values reveal that the GDP increased as high as ₦464 billion and ₦101 billion respectively.

Electric power consumption (kWh per capita) has an average value of 101.24 which implies that on the average the value of electric

Table 1: Data source and measurements

Definition of variable	Identifier	Data source	Measurement
Real Gross domestic product refers to the annual percentage change in the value of the final goods and services produced in a country within a year.	GDP	World Development Indicators (WDI, 2018)	Percentage
Electric power consumption refers to the power consumed by a household, it is expressed in kWh per capita.	elect	World Development Indicators (WDI, 2018)	Percentage
Gross fixed capital formation refers to capital invested on fixed assets, infrastructural and social amenities in a country.	cap	World Development Indicators (WDI, 2018)	Constant ($)
Working population is used as the labour force, which means the number of individuals engaged in work activities in the country.	lab	World Development Indicators (WDI, 2018)	Percentage
Fixed telephone lines refers to the amount of telephone lines that is available to the citizens for communication.	fxtl	World Development Indicators (WDI, 2018)	Percentage
Government Expenditure on health refers to the amount of money spent on the health sector.	hexp	Central Bank of Nigeria (CBN, 2017) Statistical Bulletin	Constant (₦)
Government Expenditure on education refers to the amount of money spent on the education sector.	edexe	Central Bank of Nigeria (CBN, 2017) Statistical Bulletin	Constant (₦)

Source: Compiled by the Authors, 2018

Table 2: Summary statistics of variables

Diagnostic term	GDP	ELECT	CAP	LAB	FXTL	HEXP	EDEXE
Mean	2.17E+11	101.24	2.97E+10	33355793	547152.7	5.39E+10	9.30E+10
Median	1.49E+11	91.08	1.82E+10	38411175	386446.0	9.98E+09	2.74E+10
Maximum	4.64E+11	156.73	7.03E+10	57352349	1687972.	2.58E+11	3.90E+11
Minimum	1.01E+11	50.70	1.20E+10	0.000000	151600.0	41314546	1.62E+08
Std. Dev	1.21E+11	27.02	1.91E+10	19579989	441122.4	7.80E+10	1.26E+11
Skewness	0.90	0.45	0.95	−0.82	1.29	1.38	1.27
Kurtosis	2.26	2.28	2.32	2.31	3.47	3.54	3.16
Jarque-Bera	5.68	1.85	5.95	4.76	10.35	11.97	9.85
Probability	0.05	0.39	0.05	0.09	0.00	0.002	0.007
Obs.	36	33	35	36	36	36	36

Source: Authors Computation using E-views 9, 2018

power consumption per capita is about 101.24. In terms of the maximum value of 156.73 kilowatts per capita. Looking at the skewness, all the variables but one was positively skewed. This implies that the chance of getting an extremely negative outcome is very low compared to a negatively skewed dataset. Examining the kurtosis, all the variables had their entire kurtosis coefficient is >0 which shows that the variable is leptokurtic. This also implies a low chance of getting a negative outcome.

4.2. Econometric Analysis

4.2.1. Unit root test

This is the first and most important step, it is shown from literature that most time series variables are non-stationary, and using non-stationary time series on another non-stationary time series in the model might lead to false regression result (Granger, 1986). Table 3 revealed the results of the Augmented Dickey Fuller (ADF) unit root test. Estimates from the ADF unit root test revealed that the variables in the model are stationary at first difference [real GDP (GDP), electricity power consumption (elect), gross fixed CAP, working population (LAB), FXTL, government HEXP and government expenditure on education sector (edexe). Hence, the unit root test results justified the use of the Phillip and Hansen (1990) Fully Modified OLS method (which provided the long run estimates of a model while accommodating for variables stationarity at levels and at first difference), and the Johansen cointegration method (which accounted for variables stationarity at first difference strictly) for robustness purpose and confirmation of the degree of significance of the effect of the usage of electricity power on human capital towards achieving a sustainable growth in the economy.

The results based on trace test and the maximum Eigen value statistics (as shown in Table 4) rejects the null hypothesis of no co-integrating equation among variables. The rejection of the null hypothesis implies that there are at most 5 co-integrating equations among the variables at 5% level of significance. Similarly, the long run test based on maximum Eigenvalue also confirmed that there is 5 co-integrating equation at 5% level of significance. As seen in the results in Table 5, the variables are co-integrated; that is there is a long-run or equilibrium relationship between the variables, hence, the study proceeded in carrying out the FMOLS estimation to generate the coefficient that shows the magnitude and direction of relationship within the result.

In terms of the general interpretation of the FMOLS and Johansen cointegration results as revealed in Table 6, the R- squared is very high as expected for time series data (between 0.5 and 1.0). This showed that the variables are well fitted in the model; implying joint significance of the variables to the model. Specifically, interpreting for the major variable of interest (electricity consumption), the t-statistic of the FMOLS and the Johansen cointegration estimated coefficients are statistically significant at 5% level of significance (>2), this implies the presence of individually statistically significant relationships existing

Table 3: Augmented dickey fuller unit root test for stationarity

Variable	ADF t-statistics value	Critical value (at 5%)	Order of integration	Remark
GDP	4.3378	2.9511	I(1)	Stationary
ELECT	7.6905	2.9639	I(1)	Stationary
CAP	3.1841	2.9604	I(1)	Stationary
LAB	8.1633	2.9810	I(1)	Stationary
FXTL	4.2876	2.9762	I(1)	Stationary
HEXP	9.7218	2.9511	I(1)	Stationary
EDEXE	7.4602	2.9511	I(1)	Stationary

Source: Authors' Computation using E-views software Version 9, 2018

Table 4: Estimates from trace test statistics

Hypothesised No. of CE (s)	Eigenvalue	Trace statistic	0.05 Critical value	Prob.**
None *	0.955790	239.7006	125.6154	0.0000
At most 1 *	0.920922	164.8495	95.75366	0.0000
At most 2 *	0.807659	103.9540	69.81889	0.0000
At most 3 *	0.686486	64.39026	47.85613	0.0007
At most 4 *	0.599996	36.55235	29.79707	0.0072
At most 5	0.438825	14.56163	15.49471	0.0688
At most 6	0.028595	0.696286	3.841466	0.4040

Source: Authors' Computation using E-views software Version 9, 2018

Table 5: Estimates from maximum eigen value statistics

Hypothesized No. of CE (s)	Eigenvalue	Max-Eigen statistic	0.05 Critical value	Prob.**
None *	0.955790	74.85113	46.23142	0.0000
At most 1 *	0.920922	60.89555	40.07757	0.0001
At most 2 *	0.807659	39.56370	33.87687	0.0094
At most 3 *	0.686486	27.83791	27.58434	0.0464
At most 4 *	0.599996	21.99072	21.13162	0.0378
At most 5	0.438825	13.86534	14.26460	0.0577
At most 6	0.028595	0.696286	3.841466	0.4040

Maximum-Eigen value test indicates 5 cointegrating equation (s) at the 0.05 level

Source: Authors' Computation using E-views software Version 9, 2018

between some of the components of human capital (electricity consumption, gross fixed CAP, total LAB) and economic growth while FXTL, government expenditure on health and government expenditure on education were statistically insignificant at 5% level of significance.

Concerning the direction of relationship that exist among electricity consumption and FXTL and GDP in Nigeria between the determinants of human capital development and economic growth, electricity consumption, gross fixed CAP, total LAB. In terms of the coefficient, the FMOLS estimates showed that a one unit rise in the electricity consumption will bring about a less than proportionate rise of about 0.504 (given that the variables are logged; interpretation is based on elasticities and the value of the coefficient is less than one). This means that electricity consumption does not translate automatically to economic growth of Nigeria. This suggests that the influence of electricity power consumption as a component of human capital is statistically significant but yet, it is uniquely small. However, it contributes significantly at 5% level of significance.

4.3. Granger Causality Test

The results in Tables 7 and 8 showed the null hypothesis of the direction of causality between the variables. The rule of thumb states that if the probability value of the F-statistics is less than or equal to 0.05 (Prob value ≤ 0.05), the alternative hypothesis is accepted, but if vice versa, the null hypothesis is accepted. At lag 1 and lag 2 (the first immediate time period and next) electricity power consumption as a major component of human capital development does not Granger cause economic growth while economic growth Granger causes electricity power consumption. Hence a unidirectional causal relationship exists.

Table 6: Empirical cointegration results

Dependent variable: Gross domestic product	FMOLS	Johansen cointegration coefficients
Electricity Power consumption	0.504 [5.22]	0.341 [8.5]
Gross fixed capital formation	0.148 [2.91]	0.434 [10.75]
Labour force	1.818 [6.17]	1.358 [6.42]
Fixed telephone lines	0.025 [1.06]	0.007 [0.02]
Government expenditure on health	−0.018 [−0.34]	0.05 [1.25]
Government expenditure on education	−0.016 [3.71]	−4.190 [−1.41]
R^2	0.9822	
Adjusted R^2	0.9762	
SE of Regression	0.03	
Long run variance	0.0005	
Mean dependent variable	11.32	
SD dependent variable	0.19	
Sum squared residual	0.01	

Source: Authors' Computation using E-views software Version 9, 2018. Figures in square bracket '[]' represent the t-statistic values

Table 7: Causality results at lag time period 1

Pairwise granger causality tests		
Sample: 1981 2016		
Lags: 1		
Null hypothesis		
Obs	F-Statistic	Prob.
ELECT2 does not Granger cause GDP 31	0.02900	0.8660
GDP does not Granger cause ELECT2	9.19103	0.0052

Source: Authors' Computation using E-views software Version 9, 2018

5. CONCLUSION AND RECOMMENDATIONS

This study examined how electricity consumption helps in the improvement of human capital that is necessary to attain economic growth in Nigeria. The empirical results of this study are in line with the findings of studies (like Matthew, et al., 2010; Dauda, 2010; Amassoma and Nwosa, 2011; Adawo, 2011; Nain, et al., 2017) in terms of the importance of electricity consumption. The results showed that the increased use of energy especially, electricity brings about an increase in economic growth of Nigeria. This supports the findings of Liu et al., (2018) which showed that in China particularly, the State of Beijing experienced a rapid rate of economic growth due to the high electricity power supply and usage. Similarly, South Africa is seen as the most developed country in Africa, this is largely due to the rate of development that is hinged mainly on human capital and energy-intensive development (Bah and Azam, 2017). Presently, 85% of the South Africa's electricity obtained from coal-fired power locations, hydroelectric plant generates about 10%, nuclear –powered plants generates about 4%, while non-hydro renewable energy generate just about 1% (Bah and Azam, 2017).

Therefore, from the empirical results obtained in this study, the following recommendations were made. First, in order to efficiently develop human capital towards the attainment of economic growth, a larger proportion of the population lives in rural communities; therefore, electrification in local areas will help in developing human capital in a large share. This has been seen in Guatemala and South Africa, as rural electrification increased employment and reduced poverty among the marginalized group in the South African and Guatemalan economies. Second, some other African countries have embarked on cost-effectiveness (low-cost) opportunities, for example mini-grids have been successful in Kenya (green mini-grid), Senegal (smaller community projects) and good consumer tariff in the United Republic of Tanzania (Jahan, 2000; Human Development Report-HDP, 2016). This can be done in Nigeria by granting cost-effectiveness of power usage, to achieve this in Nigeria; the government should endeavour to provide constant supply of electricity power and monitoring the tariffs charged by the parastatals in charge of the provision of electricity in Nigeria.

Table 8: Causality results at lag time period 2

Sample: 1981 2016		
Lags: 2		
Null hypothesis:		
Obs	F-Statistic	Prob.
LELECT2 does not Granger Cause LGDP 30	1.02358	0.3739
LGDP does not Granger Cause LELECT2	3.83629	0.0352

Source: Authors' Computation using E-views software Version 9, 2018

Finally, human capital is seen as an advantage, and the different classifications of educational qualification and health status constitute a part of this advantage, it stops the less priviledged people from being part (in terms of their contribution) to the high level of aggregate output growth process. The substitution of inputs for poor people boosts their production capacity which enhances the growth process. For instance, the substitution of green energy and electricity is seen as a way of developing the human capital drive, a way of poverty reduction strategy and environment-friendly policy option. The Bangladesh's Central Bank has funded the country's electricity power sustainable scheme through a low-cost support programme. Jordan and Morocco have imitated this low-cost electricity supply programmes; thus, this should be replicated in Nigeria to build up human capital and attain economic development. This should be done by ensuring a translucent and reliable procedure in monitoring the outcomes of human development agenda with public participation and assistance from the Federal government and other international partners/agencies. The intervention from local bodies, parastatals and agencies will also go a long way in contributing to human capital growth in the poorest and most remote locality in Nigeria.

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