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# *Effective Capital Development and Productivity Growth in Nigeria (1985 – 2020)*

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**Abstract – The study examined human capital development and productivity growth in Nigeria from 1985 to 2020. Therefore, the broad objective of the study was to examine the impact of human capital development on productivity growth in Nigeria. The study made use of annual time series data from 1985 to 2020. The econometric methods of Granger causality test, autoregressive distributed lag bound (ARDL) co-integration test and the ARDL error correction mechanism were employed as the analytical technique. The granger causality test revealed the existence of a uni-directional causality between productivity growth and human capital development and not the reverse. The co-integration test revealed the existence of a long-run relationship between human capital development and productivity growth in Nigeria. The ARDL error correction mechanism revealed that life expectancy at birth, total government expenditure on education, total government expenditure on health, secondary school enrolment and tertiary school enrolment were significant. However, only primary school enrolment was the variable not significant. The study concluded that life expectancy at birth, total government expenditure on education, total government expenditure on health, secondary school enrolment and tertiary school enrolment have significant impact on productivity growth in Nigeria from 1985 to 2020. The study recommended for concerted and sincere efforts by government and policy markers in building and developing human capacity through adequate educational funding across all levels.**

**Keywords – Endogenous Growth, Granger Causality, Human Capital, Productivity.**

## I. BACKGROUND OF THE STUDY

The most valuable assets in both developed and developing countries, according to Idris (2007) are humans. To achieve development, it therefore becomes imperative for these assets to be managed properly and effectively used. One way this can be done is by ensuring adequate investment is made in human capital. Human capital can be described as the collective skills, knowledge and intangible assets of individuals that can be used to create economic value. Human capital according to Soon and Benson (1997) can also be described as a tool for enhancing competitive advantage since it involves the process of training, knowledge acquisition (education), initiatives and others which are all geared towards skill acquisition. Human capital can be developed through the process of human empowerment since it is expected to facilitate active participation and from that perspective may be affirmed a major source of economic growth.

Many developed countries according to International Bank of Reconstruction and Development and World Health Organization have employed their human capital to achieve significant progress in terms of level of productivity and technological advancement. In spite of the popularity of human capital usage among developed countries however, many developing countries have still not awakened to the fact that human capital can be used as a major drive to facilitate an improved economy. Many developing countries including those of Sub Saharan Africa and West African are yet to reach their maximum capacity in spending on the component of human capital in boosting their economic growth. The lack of government spending on human capital in these Sub Saharan countries

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have contributed to numerous challenges ranging from low quality of education delivery which consequently result to poorly equipped graduates to poor infrastructures in healthcare (Park, 2010). Developing countries generally are described by their low levels of literacy, low income, poor health care system, gender inequality and low standard of living (Todaro and Smith, 2011). Further with low and often inadequate spending by government on health care and education, requisite infrastructure necessary for improved human capital development in developing countries is extremely low. This low level of human capital development hinders the productivity level of individuals and results in a range of socio-economic challenges which include poverty and unemployment in society and which have risen overtime to a high level in a number of developing countries especially those of Sub Sahara Africa. Countries with significantly developed human capital on the other hand enjoy quite a number of benefits such as reduced poverty, increased employment opportunities, equitable income and wealth distribution, gender equality and sustainable economic growth rate. Countries with poor human capital development further feature demographic indicators such as low life expectancy and high mortality rate.

Nigeria as a developing country in Sub Sahara Africa in an attempt to develop her human capital so as to achieve sustainable growth embarked on some educational programs in the past, but these have only served as conduits to transfer money to the corrupt political leaders and their cronies. In 1967, Nigeria launched a mass-oriented education program; Universal Basic Education (UBE). The program was launched at Sokoto by the president at that time, Olusegun Obasanjo. However, not long after the period of commencement, the federal government reported that the falling standard of education in Nigeria is caused by acute shortage of qualified teachers in the primary school level. It was reported that about 23 % of the over 400, 000 teachers employed in the nation's primary schools do not possess the Teacher's grade two certificate, even when the National Certificate of Education (NCE) is the minimum educational requirement one should possess to teach in the nation's primary schools (Mohammad and Jalil, 2011). Nigeria in 1976 again launched the Universal Primary Education (UPE) but as noted, the program failed due to lack of funds resulting from corruption, amongst other factors. These have caused undesirable consequences for the development of high-quality human capital in Nigeria but, have not changed the focus of the Nation of Nigeria on human capital development in its objective to achieve significant levels of economic growth.

Given the high prospects of achieving economic growth in Nigeria which human capital development may contribute to, education and health therefore continues to receive significant attention from the Nigeria government. Thus, the present study examines the impact of human capital development on economic growth in Nigeria. In particular, it explores the contribution of health and education as major components of human capital development on Nigeria's economic growth.

For the purpose of this research, tow relevant research hypotheses have been stated as follows:

HO1: Human capital development does not granger cause productivity in Nigeria

$HO_2$: There is no long-run relationship between human capital development and productivity growth in Nigeria.

## II. Human Capital Development

There has been emergence of different models from various experts and researchers on the concept of human capital development. However, of prominent of these models are the Solow and Lucas models of human capital development (Hercowitz et al., 1999). Chete and Adenikinju, (2002) opine that the main components of Solow model and Luca model of human capital development are education, health and technology. The inputs of human development are education, health and technology and the mixture of these will bring about growth in the long run (Hercowitz et al., 1999). Solow is more oriented towards the effect of technology and education intervention on the entire population as a unit whole rather than as units. His argument is based on the fact that most people in the history of human life only attain little above subsistence level of income (Hercowitz et al., 1999). Solow model answers the question of why some countries commit more to investment in people and secondly, rich countries have a lower and manageable population growth rate. Consequently, the rich countries have more opportunity to accumulate more capital per worker and this transform to higher labor productivity (Jhninga, 2013).

Solow (1956) in his model indicated that economy only maintain growth at the rate of technology. A country can only achieve sustained and constant growth through innovation and technology driven by education (Solow, 1956). Therefore, countries have to pursue mass education and increase education stock of the entire population to bring about innovation and technology that will put the growth of the country on a steady state. Also, educational development towards human capital development at individual level

is rewarded with high income earing. Therefore, it is important for both individuals and countries to fit best into the models of modern society and education is the major tool for this (Baro and Jong-Wa, 1991; Chete and Adenikinju, 2002).

### 2.1 Determinants and Measures of Human Capital Development

Soon and Benson (1997) opines that human capital refers to the stock of skills, knowledge, ideas, talents and health status of individuals which are relevant in the production process. Barro and Jong-Wa, 1991 view human capital as representing the human factor in the organization; the combined intelligence, skill and expertise that gives the organization its distinctive character. The human elements of the organization are those that are capable of learning, changing, innovating and providing the creative thrust which if properly motivated can ensure long term survival of the organization. Oyinlola and Adam (2003) opines that the concept of human capital development refers to a conscious and continuous process of acquiring and increasing the number of people with requites knowledge, education, skill and experience that are crucial for the economic development of a country. Sebastian, (1997) explains that the development process has gone from the resources exploitative with which the physical and natural resources of an economy are being organized in the transformation process is a function of the sophistication of its human resources.

In developing the human capital of a nation, the place of education is paramount. Education at all level (primary, post-primary and tertiary) as observed by Barro and Jong-Wa, (1991) contributes to human development through imparting general attitudes and discipline and specific skills necessary for a variety of workplaces. In recent times, investment in education has become very significant because as an impetus to growth and development (Oyinlola and Adam 2003). Education plays critical role, hence the need for more efficient allocation and disbursement of funds as aptly agitated for by various stakeholders such as Academic Staff Union of Universities (ASUU), Academic Staff Union of Polytechnics (ASUP), National Union of Teachers (NUT), among others, to the education sector. Basic education increases the efficiency and the participation of each individual in the society. Many developing countries have mad significant progress in ensuring better access to education as evidenced by improved literacy and enrolment rates and higher quality and more equitable distribution of education services (Idris, 2007). Education contributes to growth by improving health, reducing infertility and possibly contributing to political stability. The major importance of the educational system to any labor market would depend majorly on its ability to produce a literate, disciplined and flexible labor force via high quality education (Babatunde and Adefabi, 2005). Because of the pivotal role played by education in any economy, we considered it imperative to examine government expenditure on education as one of the determining factors of the level of human capital development and its contribution to productivity growth in Nigeria.

Another important measure of human capital development is the literacy rate of a country. Nigeria prior to independence is 1960, had a history of dominance of Quranic schools in the north and missionary schools in the south (Jhninga, 2013). All of these promoted mostly religious literacy. With the advent of Christian missionaries later came western education through which they exposed the whole of southern Nigeria and part of the inland region to literacy (Adesina 2011). Literacy efforts in Nigeria received a significant boost when UNESCO supported the establishment of an Adult literacy institute in 1963 in Ibadan to train professional adult educators (Jhninga, 2013). Then in 1982, the civilian government launched a 10-year National mass literacy campaign. In order to achieve the goals of this 10-year campaign, the Federal Government directed each of the states to establish an Agency for Mass Education. A great wind of change came in 1990; when the Federal Military Government established the National Commission for Mass Literacy and Non-formal Education to coordinate adult and non-formal education programmed in the country.

Finally, this study examines school enrolment rate as one of the measures of human capital development. Schooling is widely acknowledged as a major investment in human capital that enhances later career opportunities and wages (Ogunleye and Ayeni, 2008). It serves as an avenue for escaping poverty and reducing income inequality in an economy. The importance of schooling to a child's social and economic status later in life cannot be overemphasized (Barro and Jong-Wa, 1991). Unfortunately, in many developing countries children either do not have access to education or are enrolled in schools of questionable quality (Iwayemi and Ayodele, 1995). The objective of any reasonable government is to improve access to primary and secondary schools investing in educational infrastructure and optimizing the resources allocated to the educational sector. According to Ogunleye and Ayeni, (2008), enrolment rates improved over the years such that more than 79% of primary school aged children were enrolled in primary schools in 2002; the figure fell to 72 % in 2004. The secondary schools present a more depressing picture as only 20.6 % of the Nigerian population aged 12 – 17 years old were enrolled in secondary school in Nigeria in 1990. Ogunleye and Ayeni, (2008) further explained that the figure increased over the year to 34 % in 1996 and further to 49 % in 2002, but this is still a very low enrolment rate for a country that needs to develop citizens into highly skilled manpower. Statistics shows that secondary school

enrolment rates for 2010, 2011 and 2012 are 44.04%, 46.28% and 50.72% respectively. It can be concluded that a lot still needs to be done to improve the enrolment rate in the country.

### 2.2 Productivity

The concept of productivity has been explained variously by different people. Hercowitz et al., (1999) defined productivity as what you get out of an activity for what you put in. It is the relationship between output of goods and services and the input of resources human and non-human resources used in the production process (Sofoluwe, 2000). Output in this context can be in form of goods and services while the inputs vary from capital, energy, materials, time and labor. Productivity can also be defined as the ratio of output to input in a given period of time (Ahmed and Bukhari, 2007). In other words, it is the amount of output produced by each unit of input.

Business managers see productivity not only as a measure of efficiently, but also connote effectiveness and performance of individual organizations. Administrators are more concerned with organizational effectiveness, while the industrial engineers focus more on those factors which are more operational and quantifiable, work measurement and performance standards (Akinlo, 2005). Productivity can be computed for a firm, industrial group, the entire industrial sector or the economy as a whole. It measures the level of efficiency at which scarce resources are being utilized. Higher or increasing productivity will, therefore, mean either getting more output with the same level of input or the same level of output with less input.

### 2.3 Theoretical Framework

Many studies have examined the relationship between human capital development and economic growth (Ogunleye and Ayeni, 2008; Ousmanou et al., 2006; Becker, 1994; Idris, 2007; Alwyn, 1995; Chete and Adenikinju, 2002) based on existing economic theories that link human capital development to economic growth which include; human capital theory, augmented Solow human capital growth theory, endogenous growth theory and structural change theory. However, the augmented Solow human capital growth theory was used for the purpose of this study.

#### 2.3.1 Augmented Solow Human-Capital Growth Theory

This literature review of the growth accounting model is for illustration purpose only to demonstrate how the human capital factor fits into the economic growth model. It is not being used for proving or solving a actual economic growth scenario. The original Solow (1956) and Todaro and Sussangkarn (1994) accounting growth model is a model of capital accumulation in a pure production economy and was built on two assumptions namely:

(i) Decisions relating to savings and investment are devoid of individual optimization or exogenous and

(ii) Accumulation of factors and advancement in technology are also devoid of individual optimization or exogenous. The Solow's model concerns itself with the output (Y) produced when three inputs (i.e. capital (K), labor (L) and knowledge or the effectiveness of labor or technology (A) are mixed at any time in an economy. Therefore, a production function which has physical capital, labor and knowledge or technology was specified as shown below:

$$Y = A_t K_t^b L_t^{1-b} \qquad 1$$

Where $0 < b < 1$, Y = production output, K = physical capital; A = knowledge or technology; L = labor, t = time

NB: Time, though not a direct variable in the model, influences production output through physical capital (K) labor (L) and knowledge or technology (A).

Thus, production output changes with time only if the inputs of K, L and A changes. The multiplicative relationship between A and L implies that knowledge or technology is labor-augmenting and effective labor is a product of knowledge or technology and labor (Miller and Upadhyaya, 2000).

The original Solow model did not explicitly incorporate human capital which is the focus of this study. An augmented version of equation 1 by Miller and Upadhyaya, 2000 was developed which now includes human capital and hence fits better into this study. The role of human capital in the process of production is recognized and accounted for in this augmented Solow's growth model.

### 2.3.2 Human Capital Theory

The theory of human capital is rooted from the field of macroeconomic development theory (Soon and Benson 1997). Becker's (1994) classic book, Human Capital: A Theoretical and Empirical Analysis with special reference to education, illustrates this domain. Becker argues that there are different kinds of capitals that include schooling, a computer training course, expenditures on medical care. And in fact, lectures on the virtues of punctuality and honesty are capital too. In the true sense, they improve health, raise earnings, or add to a person's appreciation of literature over a lifetime. Consequently, it is fully in keeping with the capital concept as traditionally defined to say that expenditures on education, training and medical care, etc., are investment in capital. These are not simply costing but investment with valuable returns that can be calculated.

### 2.3.4 Endogenous Growth Theory

Endogenous growth theory, according to Todaro and Sussangkarn (1994) has stimulated economists' interest in the empirical evidence available from cross country comaprisons, bearing on the main level relationship between human capital development and economic growth. Todaro and Sussangkarn (1994) describes physical capital accumulation as sufficient to determine the dynamic evolution of output. To specify the growth path when human capital is included, it is necessary to consider an additional sector where the growth of human capital has taken place. Given that physical capital is characterized by diminishing returns, the required assumption for the model to exhibit a positive growth rate of output per worker in the steady state is that the technology for generating human capital has constant returns; meaning that the growth of human capital is assumed to be the same for a given effort, whatever the level of human capital attained. With the assumption, the rate of output growth (per worker) is positive and increasing in the productivity of education or on the job training in the creation of human capital.

### 2.3.5 Structural Change Theory

During most of the 1960s and early 1970s, economist generally describe the development proccrs as structural change by which the reallocation of labor from the agricultural sector to the industrial sector is considered the key source for economic growth. Two well-known representatives of this approach are the two-sector model (Iwayemi and Ayodele, 1995) and the structural change and pattern of development (Becker, 1994).

By focusing on the pattern of development rather than theory, the structural change models may mislead policy makers. Since the reallocation of labor from the agricultural sector to the industrial sector is considered the engine of economic growth, many developing countries implemented policies that often promote the industry and neglect agriculture. But the negative effects of policies that turned against that vital sector have come to be widely recognized (World Bank, 2000).

## III. Research Methodology

### 3.1 Research Design

This study employed the survey research design and the time series annual secondary data was adopted for the purpose of the study. The choice of the time series is premised on the fact that the data used in this study was gathered over a period of time and aims at investigating the impact of human capital development on economic growth in Nigeria.

### 3.2 Model Specification

From the literature, some of the variables that have been tested to affect productivity growth were included in the model. The model used by Idris (2007) with substitution of some variables was adopted for the study. The model is specified as:

$$GRPGDP = f(LER, TGEE, TGEH, PSE, SSE, TSE) \quad (2)$$

$$GRPGDP_t = \beta_0+\beta_1 LERt+\beta_2 GEEt+\beta_3 TGEHt+\beta_4 PSEt+\beta_5 SSEt+\beta_6 TSEt+\mu_t \quad (3)$$

Where

GRPGDP = Growth rate per capita GDP (used as proxy for productivity growth)

LER = Life expectancy rate

TGEE = Total government expenditure on education

TGEH = Total government expenditure on health

PSE = Primary school enrolment

SSE = Secondary school enrolment

TSE = Tertiary school enrolment

t = The number of observations

$\beta_0$ = Intercept of the model

$\beta_1$ = Slope (coefficient) of the estimate of LER

$\beta_2$ = Slope (coefficient) of the estimate TGEE

$\beta_3$ = Slope (coefficient) of the estimate TGEH

$\beta_4$ = Slope (coefficient) of the estimate PSE

$\beta_5$ = Slope (coefficient) of the estimate SSE

$\beta_6$ = Slope (coefficient) of the estimate TSE

$\mu$ = Error team

A-Priori expectation: on a-priori grounds, it is expected that $\beta_0 \neq 0$, $\beta_1,\beta_2,\beta_3,\beta_4,\beta_5,\beta_6 > 0$

### 3.2.1 Description of Variables

Growth Rate of Gross Domestic Product Per Capital: The growth rate of per capita GDP was used in the model as a proxy for productivity growth. It is believed that as the productivity of individuals increases, so does their income.

Life Expectancy Rate: This is the average number of years an individual at a given age is expected to live at current age specific mortality rate.

Total Government Expenditure on Health: This is the spending of the Nigeria government on health

Primary School Enrolment: This is the total enrolment in primary education, regardless of age, expressed as a percentage of the population of official primary education age.

Secondary School Enrolment: This is the total enrolment in secondary school education, regardless of age, expressed as a percentage of the population of official secondary education age.

Tertiary School Enrolment: This is the total enrolment in secondary school education, regardless of age, expressed as a percentage of the population of official tertiary education age.

### 3.3 Nature and Sources of Data

The data used in this study are annual time series secondary data on the variables covering thirty-six-year period from 1985 to 2020 obtained from various institutions and publications such as CBN statistical bulletin, annual reports, journals and world development indicators.

### 3.4 Method of Data Analysis

The methods that were employed to analyze our data: unit root test, granger causality test and Johansen co-integration regression. While the unit root test helps to ascertain the stationarity of the variables, the granger causality test helps in determining the direction of causality between human capital development and productivity growth. Similarly, the Johansen co-integration regression helps in ascertaining if there is long-run relationship among the variables.

## IV. Results and Analysis

### 4.1 Unit Root Test

To avoid spurious regression which may arise as a result of carrying out regression on time series data, we first subjected the data to stationary test by using Augmented Dickey Fuller (ADF) test. The ADF test was done with the following hypotheses: $H_0$: Variable contains unit root and hence is non-stationary, $H_1$: Variables does not contain unit root and hence is stationary.

Table 1: ADF test result

| Variable | ADF t-statistic | Probability value | Order of Integration |
|---|---|---|---|
| GRPCGDP | -4.003818 | 0.0040 | I (0) |
| LER | -4.669446 | 0.0009 | I (0) |
| TGEE | -4.688071 | 0.0007 | I (1) |
| TGEH | -6.299337 | 0.0000 | I (1) |
| PSE | -3.040630 | 0.0417 | I (0) |
| SSE | -7.814003 | 0.0000 | I (1) |
| TSE | -6.467748 | 0.0000 | I (1) |

t-statistic at significant level of 5%

From the above the ADF result indicates that GRPCGDP, LER and PSE attained stationary at level, hence they are I (0) series. However, TGEE, TGEH, SSE and TSE attained stationary at first difference. This implies that they are I (1) series.

However, in order to address the first objective of this research work, we first present the granger causality result.

### 4.2 The Granger Causality Result

As has bee noted, the granger causality test is basically a test of precedence which is designed to provide a preliminary indication of which variables precedes each and, hence is likely to exact an effect on the other variable.

Table 2 Granger Causality Result

| Null Hypothesis | Obs | F-Statistic | Prob. |
|---|---|---|---|
| LER does not granger cause GRPCGDP | 33 | 1.65759 | 0.2094 |
| GRPCGDP does not granger cause LER | | 1.63271 | 0.2141 |
| TGEE does not granger cause GRPCGDP | 33 | 0.09190 | 0.9125 |
| GRPCGDP does not granger cause TGEE | | 0.18416 | 0.8328 |
| TGEH does not granger cause GRPCGDP | 33 | 0.39993 | 0.6743 |
| GRPCGDP does not granger cause TGEH | | 0.29572 | 0.7464 |
| PSE does not granger cause GRPCGDP | 33 | 0.89654 | 0.4198 |
| GRPCGDP does not granger cause PSE | | 3.72758 | 0.0372 |
| SSE does not granger cause GRPCGDP | 33 | 0.47567 | 0.6266 |
| GRPCGDP does not granger cause SSE | | 2.04260 | 0.1493 |
| TSE does not granger cause GRPCGDP | 33 | 0.14346 | 0.8670 |
| GRPCGDP does not granger cause TSE | | 2.12367 | 0.1391 |

Lag length = 1, Decision rule: reject $H_0$ if probability value is < 0.05 or calculated F-statistics is > critical F-statistics. DNR stands for do not reject $H_0$ which means that we accept $H_0$. R, stands for $H_0$ = reject $H_0$.

The granger causality result reported in table 2, above suggests a uni-directional causality running from growth rate of per capita GDP (GRPCGDP) to primary school enrolment (PSE) at the 5 % level of significance. This implies that GRPCGDP is seen to cause primary school enrolment. But primary school enrolment has not caused per capita GDP growth. In other words, GRPCGDP granger cause PSE but not reverse. Therefore, we reject the null hypothesis at 5% for the second case. The uni-directional causality implied that productivity growth (GRPCGDP) has facilitated the advancement of human stock of knowledge; but human capital has not caused productivity growth in Nigeria. It is interesting to know that productivity growth (which basically involves technological know-how and processes) has facilitated human activities. Thus, is evident in teaching methods via the use of information and communication technologies (ICT), as well as improvement in other sectors such as mechanized activities in farming, manufacturing, transportation and communication has facilitated human development.

Overall, our findings shed lights on the nature of the relationship between human capital development and productivity growth and in particular, clearly suggest that human capital development is not a key determinant of productivity performance in Nigeria and that productivity growth is a major determinant of human capital development in Nigeria. In what follows, we proceed to a more robust analysis of the relationship between control of human capital development and productivity growth rate in Nigeria.

### 4.3 ARDL Bounds Test

This is carried out to ascertain the long run relationship between human capital development and productivity growth in Nigeria.

Table 3: ARDL Bounds test

| Null Hypothesis: No long run relationship exists | | |
|---|---|---|
| Test statistic | Value | K |
| F-statistic | 14.77862 | 6 |
| Critical Value Bounds | | |
| Significance | 10 Bound | 11 Bound |
| 10% | 2.12 | 3.23 |
| 5% | 2.45 | 3.61 |
| 2.5% | 2.75 | 3.99 |
| 1% | 3.15 | 4.43 |

$H_0$: no long run relationship, $H_1$: there is long run relationship. Decision Rule: Reject the null hypothesis, if the F-statistics is greater than level of significance (1%, 2.5%, 5% and 10%) of the upper bound I (1), do not reject if the F-statistics is less than the bound interval.

From the table above, the bound test F-statistics shows a value of 14.77862 which is greater than the upper bound I (1) statistics at all levels, the null hypothesis is therefore rejected. It shows that there exists a long run relationship between the variables in the model and they are co-integrated. This implies that the requirement for fitting in an error correction models is satisfied.

### 4.4 Residual Diagnostics

The Jarque-Bera normality test is to test whether or not the residuals are normally distributed. Since the p-value (0.924503) is greater than 5% significance level, then the model is normally distributed. When Breush-Godfrey serial correlation with a p-Value of 0.4244 is greater than 5% significance level, it means that the residuals are not serially correlated. In the same vein, Breush Pgan Godfrey test shows no evidence of heteroscedasticity since the p-value of 0.4337 is greater than 5% significance level, then there is absence of heteroscedasticity in the model.

The variables in the regression line pass through the necessary diagnostic tests regarding serial correlation, heteroskedasticity and normality of error term.

Table 4: Residual Diagnostics Result

| Diagnostic test | t-statistics | Probability |
|---|---|---|
| Jarque-Bera normality test | 0.156999 | 0.924503 |
| Breusch-Godfrey serial correlation LM test | 1.022397 | 0.4244 |
| Heteroskedasticity test: Breusch-Pagan-Godfrey | 1.191201 | 0.4337 |

### 4.5 ARDL Error Correction Model (ECM) Result

As the results of the ECM clearly show, most of the explanatory variables met the theoretically a-priori expectations earlier outlined. In particular, life expectancy rate, total government expenditure on education, primary school enrolment and secondary school enrolment has positive effect on growth rate of per capita GDP as expected on a-priori. On the other hand, total government expenditure on health and tertiary school enrolment has negative effect on growth rate of per capita GDP which is not consistent with a-priori expectation.

It is also found that there is no serial correlation as indicated by the DW statistic of 2.25. Thus, there is no reason to suspect that our regression result may have suffered from any problem of autocorrelation.

Looking at the statistical significance of the regression model, life expectancy at birth is found to be statistically significant as indicated by the t-value of 5.496612 and a probability value of 0.0009 which is less than the conventional value of 0.05. The coefficient of life expectancy rate is found to be 6.310036 indicating that a unit increase in life expectancy rate will lead to an increase in GPRCGDP of 6.3 units. This large coefficient makes the need for effective policies aimed at improving life expectancy rate in Nigeria and clearly shows how efficient such policies would be in improving productivity level in Nigeria.

Table 5: Estimate of the error correction model

| Variable | Coefficient | Std. Error | t-statistic | Prob. |
|---|---|---|---|---|
| D(LER) | 6.310036 | 1.147987 | 5.496612 | 0.0009 |
| D(TGEE) | 0.048146 | 0.013886 | 3.467297 | 0.0104 |
| D(TGEH) | -0.130256 | 0.019758 | -6.592686 | 0.0003 |
| D(PSE) | 0.103728 | 0.066951 | 1.549322 | 0.1652 |
| D(SSE) | 0.518997 | 0.078083 | 6.646700 | 0.0003 |
| D(TSE) | -2.051644 | 0.384950 | -5.329641 | 0.0011 |
| CointEq(-1) | -1.535728 | 0.106666 | -14.39757 | 0.0000 |
| R-squared | 0.969858 | Mean dependent variable | | 0.023042 |
| Adjusted R-Squared | 0.935410 | S.D dependent variable | | 4.399230 |
| S.E of regression | 1.118046 | Akaike info criterion | | 3.362886 |
| Sum squared resid. | 17.50036 | Schwarz criterion | | 4.149266 |
| Log likelihood | -35.12473 | Hannan-Quinn criterion | | 3.619226 |
| Durbin-Watson stat. | 2.225497 | | | |

Zooming in on the effect of total government expenditure on education (TGEE) on growth rate per of capita GDP, it is found that TGEE has a positive and significant effect on GRPCGDP with t-value of 3.467297 and probability value of 0.0104 which is less than 0.05. This suggests that TGEE has a significant impact on GRPCGDP in Nigeria over the period of analysis. Hence, government should spend more on the education sector as it has the capacity of increasing productivity level in Nigeria. On the other hand, total government expenditure on health (TGEH) is found to be wrongly signed but statistically significant at the conventional level of significance with t-value of -6.592686 and a probability value of 0.0003. The coefficient of TGEH in our regression model is found to be -0.130256. This suggests that a unit increase in TGEH will lead to 0.13 units decrease in growth rate of per capita GDP in Nigeria. However, in the long run, expenditure on health has the tendency of improving productivity level and is therefore encouraged.

Furthermore, the results show that primary school enrolment (PSE) has a positive but insignificant effect on GRPCGDP in Nigeria given a t-statistics value of 1.549322 and a corresponding p-value of 0.1652. Hence, PSE has no significant effect on GRPCGDP and may be due to the poor standard of primary education in Nigeria which needs total overhaul. On the other hand, the coefficient of secondary school enrolment (SSE) was rightly signed and statistically significant given a t-statistics of 6.646700 and a corresponding p-value of 0.0003. The coefficient of SSE is 0.518997 and implies that a unit increase in SSE will lead to a 0.5 increase in GRPCGDP. Generally, the findings imply that SSE is a significant variable that determines growth in Nigeria. Hence, government should invest in SSE as it has the capacity of improving the productivity level of the country.

Conversely, the results show that the coefficient of tertiary school enrolment (TSE) was wrongly signed and statistically significant having a t-statistic of -5.329641 and a corresponding p-value of 0.0011. The coefficient is -2.051644 and implies that a percentage increase in TSE will in a 5.3 % decrease in GRPCGDP. This does not conform to a-priori expectation based on existing theories as it is expected that increase in tertiary school enrolment should result in increase in productivity level. However, the government should invest more in tertiary education as it has a significant role to play in productivity growth in the country.

Furthermore, as can be seen from the regression results, our regression model is robust and our explanatory variables adequately explained the dependent variable because as the R2 clearly shows that approximately 97% of the variation in growth is explained by the variations in the explanatory variable included in the regression model.

Moreover, an important characteristic to be noticed in table 5 is the coefficient of the parameter of error correction term. The coefficient of the error correction term appears with the right sign (i.e negative) and statistically significant. This shows that about 15.3 % disequilibria in GRPCDP in the previous year were corrected for in the current year. It therefore, follows that the ECM could rightly correct any deviations from short run to long run equilibrium relationship between GRPCGDP and the explanatory variables.

## V. Conclusion

This research has shown with clear analysis that human capital development has a significant positive effect on productivity growth in Nigeria. From the causality result, it was seen that productivity growth causes human capital development in Nigeria and not the reverse. Similarly, the ECM result shows that total government expenditure on health and tertiary school enrolment has a negative effect on productivity growth in Nigeria. Expectedly, we found that life expectancy at birth, total government expenditure on education, primary school enrolment and secondary school enrolment have a positive and statistically significant effect on productivity growth in Nigeria. Hence, the study concluded that productivity growth causes human capital development and that life expectancy at birth, total government expenditure on education, primary school enrolment and secondary school enrolment are all important variables that determine productivity growth in Nigeria.

## VI. Recommendations

In view of the results generated, it becomes pertinent to advance certain issues that could enhance productivity growth in Nigeria, given the dynamic human capital endowment Nigeria possesses. Hence, these issues are discussed as thus;

i) The government and policy makers should as a matter of urgency give high priority to human capital development. Particularly, concerted and sincere efforts should be made in building and developing human capacity through adequate educational funding across all levels since it remains the major way of attaining sustainable productivity growth and by extension endear economic development.

ii) There should be adequate monitoring and evaluation at all levels of government. Generally, for any economy to advance in all spheres, it is very important that whatever policies are being implemented, adequate monitoring process through relevant bodies are put in place. This is important feedback mechanism for evaluation process, as to where the economy was, where it is and where it intends to be. If set expectations are met, there will be a multiplier improvement in the economy, but if not, a proper documentation will help review policies as required. In essence, domestic factors, the variation in the level of education embodied in the labor force is one of the primary reasons for the observed differences in productivity among countries. For Sub-Saharan countries and particularly Nigeria, it has been observed that the relevant bottleneck preventing the adoption and development of new technology is the lack of human capital necessary to implement the new technology in a productive fashion; this therefore, may account for the human capital not causing productivity growth in Nigeria.

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