Review Article

PUBLIC EDUCATION FUNDING AND ECONOMIC GROWTH IN NIGERIA; ARDL-VECM AND CAUSAL INFERENCE APPROACH

ABSTRACT

Considering the enormous impact of poor standard of educational system in Nigeria over the years, the study investigated the effects of public education funding on economic growth in Nigeria from 1985 to 2019. The paper used secondary data sourced from both Central Bank of Nigeria Statistical Bulletin and World Bank's Development Indicators 2019. The paper employed Auto-Regressive Distributed Lag co-integration, Error correction mechanism and granger-causality tests as technique for data analysis. The ARDL bound test co-integration results revealed that RRETE, RCETE and Inflation have positive relationship with Economic growth. However, RETE, SEDU and PRI have indirect influence on Economic growth in Nigeria. Statistically, only RRETE has a long run causal effect on economic growth. ARDL Error Correction Regression output showed that RETE and RCETE are significant at 10% level while PRI is significant at 5% level this indicates the existence of short run causal relationship with the establishment of ECM long run equilibrium adjustment speed. The causal results revealed unidirectional inference between SEDU and RETE, PRI and RETE, PRI and RRETE with no feedback effect. Therefore, the study recommended educational funding targeted at secondary and primary education system in order to acquire productive skills and knowledge to stimulate economic growth and development in Nigeria. There is need to meet the UNESCO funding ratio for both recurrent and capital expenditure on education sector.

Keywords: Recurrent education expenditure, Capital education expenditure, Economic Growth

1.0 Introduction

Education expenditures played a very crucial role in human capital formation and hence economic growth in the world. The spending on education not only provides skills to individuals but equally elevates people out of poverty and enable countries to be more productive. In the case of Nigeria, the sector is currently in crisis with no much evidence of improvement in the

standard and values. There are numerous increasing complaints about poor standard of education in Nigeria at a period when globalization demands much from the educational system in terms of preparation for skillful labour force. The major challenge of public education remains the commitment by the government to focus on funding public education to enhance quality learning. Among the challenges faced in the sector are poor states of education facilities, disrupted academic calendar caused by incessant strike as well as the state of the learning institutions which has caught the attention of policies maker.

Orji and Job (2013) noted that for Nigeria economy to be in a desirable position with meaningful development there is need for more pragmatic approach to educational sector reforms in order to ensure sustainability, soundness and healthy environment in the system. Over the years, Nigerian government had made effort to improve human resources through expenditure on the provision of free education services, scholarships, payment of bursaries, provision of more schools and increased funding in terms of capital and recurrent expenditure. However, this effort seems not to have reflected the desire outcome. This is worrisome and hence, the nexus between educational expenditure and economic growth in Nigeria becomes somewhat blur and therefore needs more revelation. The budgetary allocation to the education sector showed that in year 2009, #221.19billion, #249.09billion in 2010 and increased to #306.3billion in 2011, the sector got #426.53billion in 2013, therefore rise to #493billion in 2014, however reduced thereafter to N392.2billion in year 2015 with further reduction to #369.6billion in 2016, hence increase to #550billion in 2017 and #605.8billion in 2018 before declining to #462.24 in 2019.

The percentage of the total budget allocated to the education sector is far less than 26 percent recommended by the United Nations Education, Social and Cultural Organization (UNESCO) for developing countries. It is worrisome that Nigeria government has not been able to meet the basic recommendation over the years which have virtually affected the education sector and resulted to inadequate of basic facilities for teaching with inconsequential economic growth. Based on this concern, the study examines how the public expenditure on education influences economic in growth in Nigeria both in the long and short run term with a causal inference approach yet to be explore by others scholars.

2.0 Theoretical Proposition and Literature Review

The study is based on the Aldolph Wagner 1880 theory, the theory link the relationship between the increasing government spending and economic growth and assumed inherent tendencies for

governments activities to continually increase in Nigeria with the federal, state and local governments over time, both intensively and extensively. The functional relationship is assumed to exist between the growth rates recorded by an economy and the growth rates of activities performed by government to such an extent that the government sector grows faster than the general economy. Also, Psacharopoulos (2006) opined that education investment produces returns like investment in physical capital. This is due to knowledge and spillover effect of education as demonstrated in the work of Nelson and Phelps (1966). This corroborates the work of Romer and Weil (1992) in line with Solow growth theory which states that human capital is endogenously determined in an economy. Consequently, to grow an economy, the human capital should be enhanced through adequate investment.

In Nigeria, several studies have been carried out on the link between education spending and economic growth with mix findings, Ayeni and Omobude (2018) employed Autoregressive Distributed Lag (ARDL) and bound test to analyze the relationship between educational expenditure and economic growth in Nigeria with time series data covering 1987 to 2016. They found that recurrent educational expenditure had direct and significant effect on real GDP in both short run and long run while capital expenditure had direct and insignificant impact on RGDP. Jelilov, Aleshinloye, and Önder (2016) investigated the effects of components of education expenditure on economic growth of Nigeria with time series data ranging from 1970 to 2006. Employing ordinary test squares (OLS) technique, the result showed that capital expenditure on education, recurrent expenditure on education, and secondary school enrolment have direct and significant impact on economic growth while primary school enrolment had inverse and insignificant influence on RGDP.

Inimino, Tubotamun and Shaibu (2017) investigated the effect of public education expenditure on economic growth in Nigeria with time series data spanning 1980 to 2015. The study adopts co-integration, Error Correction Mechanism and Granger Causality techniques and the results revealed the presence of long-run relationship among the variables. Also the findings showed that capital education expenditure and government recurrent education expenditure exert significant and direct impact on economic growth, while gross capital formation does not have any significant effect on economic growth. Finally, there exist a unidirectional relationship between government capital education expenditure and real gross domestic product, government

recurrent education expenditure and real gross domestic product and between gross capital formation and real gross domestic product.

Ojewumi and Oladimeji (2016) analyzed the impact of government funding on the growth of education in Nigeria with time series data ranging from 1981 to 2013. The study adopts OLS method and the result revealed that both capital and recurrent expenditure on education have growth inverse and significant effect on growth in Nigeria. The link on recurrent expenditure and economic growth equally draw Obi and Obi (2014) to examine the impact of expenditure on education on the economic in Nigeria with a time series data spanning 1981 to 2012. Employing OLS and cointegration proposed by Johansen, the findings revealed that there is no long run equilibrium relationship existing between recurrent expenditure on education and economic growth. Also, the result indicates a positive and significant relationship between recurrent expenditure on education and GDP.

Using Co-integration and Granger causality techniques in the analysis of effect of education expenditure on economic growth in Nigeria from 1981-2010, Muhammad and Benedict (2015) found a long run relationship existing among real gross domestic product, total government expenditure on education, recurrent expenditure on education and Primary school enrolment. Also, the result indicates that there is no causality between economic growth and total government expenditure on education, Primary school enrolment and Growth Rate GDP, Primary school enrollment and total government expenditure on education, and between recurrent expenditure on education and RGDPG, while a bi-directional causality exist between recurrent expenditure on education and total government expenditure on education.

Meanwhile, Adetula et al. (2017) investigated the effect of education funding on economic development in Nigeria. Using a time series data ranging from 2006 to 2015 and employing Ordinary Least Square (OLS) regression technique, the findings indicates that education funding has significant and direct impact on GDP. Omojimite (2010) on the relationship between education and economic growth in Nigeria from 1980-2005, cointegration and Granger Causality Test were employed. And the results indicate the existence of long run relationship between public expenditures on education, primary school enrolment and economic growth. Also, the findings showed that there is unidirectional causality between public expenditures on education and economic growth (that is, causality runs from education expenditure to economic growth). While, a bi-directional causality exist between public recurrent expenditures on education and

economic growth. However, there is no causal relationship between capital expenditure on education and growth and primary school enrolment and economic growth.

The experience of other countries was also reviewed, in Turkey, Mercan, and Sezer (2014) investigated the association between education expenses and economic growth 1970-2012 using OLS technique. Their result however showed that education expenses had a direct and significant impact on and economic growth in the Turkish economy. Kaur, Habibullah, and Baharom(2014) on the association between education expenditure and economic growth in China and India from 1970 to 2005 revealed a cointegration between income level of Gross Domestic Product per capita and education expenditure in both China and India. The study employed OLS, cointegration and VECM techniques and the findings also revealed that in China, a unidirectional relationship runs from income level to education expenditure while it runs from educational expenditure to income level in India.

In India, the analysis of the causal relationship between public expenditure and economic growth from 1973 to 2012 was investigated by Palamalai (2014), the study employed co-integration approach and error correction model and showed that long-run equilibrium exist between public expenditure and economic growth. Also, the ECM indicated a uni-directional causality running from economic growth to public expenditure in both short-run and long-run. A study in Malaysia carried out by Mohd and Fidlizan (2012) on the relationship between government expenditure in education and economic growth 1970 to 2010 by using Vector Auto Regression (VAR) technique found that long run association existed between the variables. Also, economic growth granger causes government expenditure on education in the short run and as such education influenced economic growth.

In terms of cross-country studies, Mallick, Das and Pradhan (2016) empirically examined effects of education expenditure on economic growth in 14 Asian countries with a panel data spanning 1973 to 2012. The study employed panel regression, co-integration and panel vecm techniques and the findings showed that a long-run equilibrium relationships exist between expenditure on education and economic growth in all the countries. Also there exist a direct and significant relationship between education expenditure and economic development while causality runs from economic growth to expenditure on education in both short run and long run with expenditure on education causing economic growth only in the long-run. The result also showed a positive impact of educational expenditure on economic growth.

Idrees, and Siddiqi (2013) employing heterogeneous panel method in the analysis of a long-run relationship between public education expenditures and economic growth from 1990 to 2006 in 14 countries comprising 7 developed (UK, US, Canada, Germany, France, Italy and Japan) and 7 developing (Pakistan, India, China, Turkey, Poland, Russia and South Africa) countries, found that a long-run relationship exist between public education expenditures and gross domestic production. Also, the result of panel fully modified OLS technique indicated that expenditures influence economic growth more in developing countries than developed countries.

3. Method of Data Analysis

3.1 Model specification

With the major aim of determining the influence of public education spending on economic growth in Nigeria, the study considers growth rate of gross domestic product (GDPGR) as the dependent variable, while the explanatory variables comprises ratio of public education expenditure to total expenditure (RETE), ratio of recurrent education expenditure to total expenditure (RRETE), ratio of capital education expenditure to total expenditure (RCETE), secondary school enrolment (SEDU), primary school enrolment (PRI) and inflation rate (INF) as control variable. Schematically, association between dependent and independent variables of the model is given as;

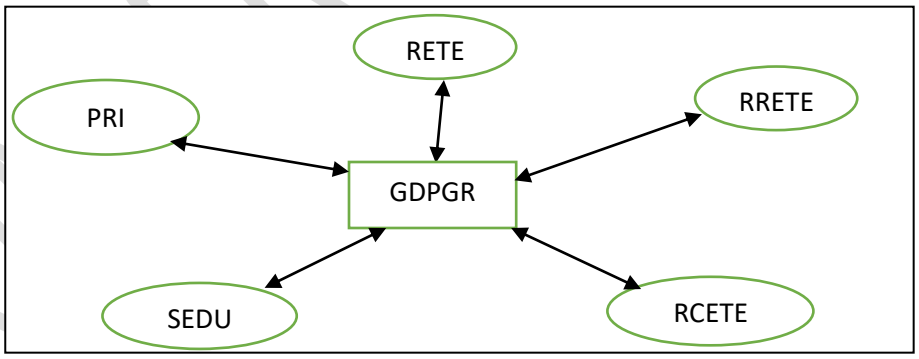

Figure 1: Schematic representation of the relationship between economic growth and public education funding outcomes. Source: Author's computation

Based on the objectives of the study, the functional equation yields;

GDPGR = F (RETE, RRETE, RCETE, SEDU, PRI, INF) (1)

The above equation implies that economic growth is a function of RETE, RRETE, RCETE,SEDU, PRI and INF. Building on the works of Omojimite (2010), Jelilov, Aleshinloye, and Önder (2016) and Ayeni and Omobude (2018), we employ the ARDL co-integration method and pair-wise granger causality techniques to analyze the relationship between education spending and economic growth. Econometrically, the general model is specified as;

$$GDPGR = \beta_0 + \beta_1 RETE + \beta_2 RRETE + \beta_3 RCETE + \beta_4 SEDU + \beta_5 PRI + \beta_6 INF + \mu_t \quad (2)$$

Where

GDPGR = growth rate of gross domestic product,

RETE = ratio of public education expenditure to total expenditure,

RRETE = ratio of recurrent education expenditure to total expenditure,

RCETE = ratio of capital education expenditure to total expenditure,

PRI = primary school enrolment,

SEDU = secondary school enrolment,

INF= inflation rate,

β_0 = intercept

$\beta_1 - \beta_6$= coefficients of the explanatory variables to be estimated and

$\mu_t$is the white noise assumption

By apriori, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5 > 0$ while $\beta_6 < 0$ which means the explanatory variables are expected to cause economic growth directly with only inflation having inverse relationship

3.2 Estimation Techniques

We estimate the specified model above using the ARDL co-integration approach developed by Pesaran and Shin (1999) and Pesaran et al. (2001), Error correction mechanism and granger-causality tests. However, in order to avoid spurious result, we conduct the ADF and PP unit roots test to dictate the level of integration.

3.2.1 Unit Root Tests

In order to avoid spurious result, we tested all the variables for stationarity using the conventional ADF (the Dickey–Fuller generalized least square) de-trending test as proposed by Elliot *et al*. (1996) and the Phillips– Perron (PP) test by Phillips and Perron (1988). Both unit

roots complement each other, that is, where they agree at a particular order of integration, we accept and in a situation where they disagree, we take the first outcome.

Hence the null hypothesis is: $\beta = 0$ (i.e β has a unit root), and the alternative hypothesis is $H1$: $\beta < 0$

3.2.2 Co-integration with ARDL

In testing for the long-run and short-run interactions among the variables of interest (GDPR, RETE, RRETE, RCETE, SEDU, and PRI), the study adopts the autoregressive distributed lag (ARDL) and bound test for co-integration technique as a general vector autoregressive (VAR). This Pesaran and Shin (1999) and Pesaran et al. (2001) approach is preferred because of several advantages it has over Johensen's method. Such merit include; (a). It has two set of critical values of low and upper bounds which classify explanatory variables into pure I(1), purely I(0) or mutually co-integrated**.** (b). it does not require variables to be integrated of same order (I(1) unlike Johensen. (c). It provides unbiased long-run estimates with valid t' statistics if some of the model repressors are endogenous (Narayan 2005 and Odhiambo, 2008) and (d) it provides a technique of assessing short run and long run impacts of variables on the other.

Thus, the generalized ARDL(p, q) model is specified as;

$$\mathbf{Y_t}=\boldsymbol{\gamma 0 j} \ +\sum_{i=1}^{p} \boldsymbol{\delta j}\ \mathbf{Yt-1}+\sum_{i=0}^{q} \boldsymbol{\beta' j}\ \mathbf{X\ t-1}\ +\boldsymbol{\varepsilon_{jt}}(1)$$

Where Y_t is a vector and the variables(**Xt**) are to be purely I(0) or I(1) or cointegrated

B and δ are coefficients;γ is the constant; j=1,….,k; p,q are the optimal lag orders. εit is the vector of the error terms- unobservable zero mean white noise vector process since our model involve six variables that is one dependent and six explanatory variables, so ARDL (p, q1, q2, q3, q4, q5 q6) model is specified thus;

$$\begin{aligned}\Delta GDPR)_t = \ & \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta GDPR)_{t-i} \ + \sum_{i=0}^{p} \beta_2\, \Delta(RETE)_{t-i} + \sum_{i=0}^{p} \beta_3\, \Delta(RRETE)_{t-i} \\ & + \sum_{i=0}^{p} \beta_4\, \Delta(RCETE)_{t-i} + \sum_{i=0}^{p} \beta_5\, \Delta(\mathrm{SEDU})_{t-i} + \sum_{i=0}^{p} \beta_6\, \Delta(PRI)_{t-i} \\ & + \sum_{i=0}^{p} \beta_7\, \Delta(INF)_{t-i} + \delta_1\, (GDPR)_{t-i} + \delta_2\, (RETE)_{t-1} + \delta_3\, RRETE)_{t-1} \\ & + \delta_4\, (RCETE)_{t-1} + \delta_5\, (SEDU)_{t-1} + \delta_6\, ln(PRI)_{t-1} \delta_7\, ln(INF)_{t-1} \\ & + \mathrm{vt} \qquad \ldots\ldots(2)\end{aligned}$$

Where δ_i are the long run multipliers, β_0 is the intercept and υ_t is the white noise errors

The first step in the ARDL bound testing approach is to estimate equation (2) by the Ordinary Least Squares in order to test for the existence of a long run relationship among the variables by conducting an F- test for the joint significance of the coefficients of the lagged levels of the variables. That is:

H_0:$\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = 0$ against the alternative hypothesis, that is:

H_1:$\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq \delta_7 \neq 0$.

Once co-integration is established, the conditional ARDL long run model can be established as:

$$(GDPR)_t = \beta_0 + \sum_{i=0}^{p} \beta_{1i} (GDPR)_{t-i} + \sum_{i=0}^{p} \beta_{2i} (RETE)_{t-i} + \sum_{i=0}^{p} \beta_{3i} (RRETE)_{t-i} + \sum_{i=0}^{p} \beta_{4i} (RCETE)_{t-i} + \sum_{i=0}^{p} \beta_{5i} (SEDU)_{t-i} + \sum_{i=0}^{p} \beta_{6i} (PRI)_{t-i} + \sum_{i=0}^{p} \beta_{7i} (INF)_{t-i} + Ut \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The next step is to obtain the short run dynamics parameter by estimating an error correction model (ECM) associated with the long run estimate. This is specified as:

$$\Delta(GDPR)_t = \beta_0 + \sum_{i=1}^{p} \beta_{11} \Delta(GDPR)_{t-i} + \sum_{i=1}^{p} \beta_{2l} \Delta(RETE)_{t-i} + \sum_{i=1}^{p} \beta_{31} \Delta(RRETE)_{t-i} + \sum_{i=1}^{p} \beta_{41} \Delta(RCETE)_{t-i} + \sum_{i=0}^{p} \beta_{51} \Delta(SEDU)_{t-i} + \sum_{i=1}^{p} \beta_{61} \Delta(PRI)_{t-i} + \sum_{i=0}^{p} \beta_{71} \Delta(INF)_{t-i} + \lambda ECM_{t-1} + Ut \quad \ldots\ldots\ldots (4)$$

All coefficients of the short run equation are coefficients relating to the short run dynamics of the model convergence to equilibrium and represent the speed of adjustment and the ECM is the error correction term. However, If not co-integrated, the ARDL in equation 2 will be interpreted as short run causal effect

3.3 Sources of Data and Measurement of Variables

Data for the study is an annual time series data sourced from Central Bank of Nigeria (CBN) Statistical Bulletin and World Bank's Development Indicators (WDI). The data covers the period 1985 to 2019. Considering growth rate of GDP as dependent variable and education spending and outcomes as explanatory variables, the variables are measured as;

Economic growth (GDPR): this is the annual percentage growth rate of GDP at market prices which is measured in constant local currency.

Ratio of public education expenditure to total expenditure (RETE); is measured as a percentage of total government expenditure on all sectors such as transfers to local, regional and central government by foreign sources.

Ratio of recurrent education expenditure to total expenditure (RRETE) is measured as the percentage of total expenditures on administrative, ministerial and all day to day transactions of government.

Ratio of capital education expenditure to total expenditure (RCETE) refers to percentage of total government expenditure on capital projects such as constructions, buildings, plants and Machineries, etc.

Secondary school enrolment (SEDU) refers to ratio of total enrollment irrespective of age to population which corresponds to the secondary school level

Primary school enrolment (PRI) is measured as the ratio of total enrollment, children irrespective of age to the population of those within the school age

4.0 Result of the Unit Root Test

We employ the Augumented Dickey-fuller (ADF) and Philip Perron Unit root tests to test the stationarity status of the variables to avoid regressing spurious regression. The result indicates that the variables are integrated of order one and zero. Some of the variables are stationary at levels while others are integrated at first difference. Hence the series are integrated of different orders. That is, a combination of both level- and first-difference stationarity; I(1) and I(0). This requires a further test of long run relationship with bound test (ARDL).

Table 1: **Unit Root Test (ADF and PP)**

	Level I(0)		*Difference I(1)*		*Decision*
Variables	*ADF*	*PP*	*ADF*	*PP*	
GDPR	*-4.6244****	*-4.6244****	*-8.4521****	*-27.694****	
	(0.004)	(0.004)	(0.0000)	(0.0000)	I(0)
RETE	*-3.679***	*-3.247**	*-6.8819****	*-9.1601****	
	(0.038)	(0.092)	(0.000)	(0.000)	I(1)
RRETE	*-3.880***	*-4.014***	*-6.193****	*-13.14****	
	(0.024)	(0.017)	(0.000)	(0.000)	I(0)
RCETE	*-2.753*	*-2.699*	*-9.490****	*-19.43****	
	(0.223)	(0.243)	(0.000)	(0.000)	I(1)

SEDU	***-2.02944***	***-2.12424***	***-5.059******	***-5.080******	
	(0.564)	(0.514)	(0.001)	(0.001)	I(1)
PRI	***-3.681****	***-3.771****	***-3.4817****	***-5.663******	
	(0.038)	(0.031)	(0.058)	(0.000)	I(0)
INF	***-2.75527***	***-2.94321***	***-4.1313****	***-6.403******	
	(0.224)	(0.162)	(0.017)	(0.000)	I(1)

*Significant at 10%, **Significant at 5%, and ***Significant at 1%.
The asterisks indicate the rejection of null hypothesis of unit root
Source: Authors Computations

4.1 Results of Bound Test for Co-integration

The results of the bound test for co-integration reveals that there is co-integration or long run relationship exist among the variables. This is because both values of F-statistics and t-statistics are higher than the critical values at both upper bound [i.e. I(1)] and lower bound {which is (I(0)}.Hence, we estimate the ARDL error correction mechanism (ECM). The long run effect indicates that only RRETE has a long run causal effect on GDPR since its probability value is 0.0145 which is less than 5% level of significant.

Table 2: Bound Test for Cointegration

		F-Bound test			***T-Bound test***				
			F-statistic				***t-statistic***		***Decision***
DEPVAR	***Value***	***Signif***	***I(0)***	***I(1)***	***Value***	***Signif***	***I(0)***	***I(1)***	
GDPR	***5.4466***	10%	***2.12***	***3.23***	***-5.5398***	10%	***-2.57***	***-4.04***	
		5%	***2.45***	***3.61***		5%	***-2.86***	***-4.38***	***Cointegration***
		2.5%	***2.75***	***3.99***		2.5%	***-3.13***	***-4.66***	***since f*>I(1) &***
		1%	***3.15***	***4.43***		1%	***-3.43***	***-4.99***	***t*>I(1)***
	LONG RUN COEFFICIENT								
VAR	***RETE***		***RRETE***		***RCETE***	***SEDU***		***PRI***	***INF***
COEF	***-2.079***		***4.696***		***0.760***	***-0.125***		***-0.091***	***0.045***
PROB*	0.3074		0.0145		0.7750	0.3898		0.6800	0.5126

Source: Authors Computations

4.2 Results of ARDL- Error Correction Regression

After dictating a co-integration among the variables, we conduct the error correction mechanism (ECM) test to see the rate at which adjustment is made between short run and long run. The coefficients of RETE RCETE are significant at 10% level of significance while PRI is significant at 5% level of significance which indicates the existence of short run causal relationship. The adjustment term (ECM) which is -1.058 with prob value of 0.0000 which less than 1% level of

significance. Thus, the ECM is both rightly signed and statistically significant and as such, the ECM of 1.06 means that reversion to long run equilibrium is at an adjustment speed of about 106 percent.

Table 3: Error Correction Regression (Mechanism)

VARIABLES	*D(RETE)*	*D(RRETE)*	*D(RCETE)*	*D(PRI)*	*CointEq(-1)**
Coef	***3.251***	***-1.829***	***-3.549***	***0.475***	***-1.058***
*prob**	0.0849	0.3293	0.0765	0.0507	0.0000

Source: Author's computation

4.3 Results of Pairwise Granger Causality Test

The granger causality test shows that a unidirectional causality exist between SEDU and RETE, PRI and RETE, PRI and RRETE, RCETE and RETE, RETE and INF, RRETE and RCETE, SEDU and RCETE, INF and PRI.

Table 4: The Granger causality result

Null Hypothesis	*F-statistics (Marginal sig value)*	*DIRECTION*
RCETE does not Granger Cause RETE	***3.002****(0.0659)	***RCETE RETE***
SEDU does not Granger Cause RETE	***4.133*****(0.0267)	***SEDU RETE***
PRI does not Granger Cause RETE	***4.5872*****(0.027)	***PRI RETE***
PRI does not Granger Cause RRETE	***7.1628******(0.003)	***PRI RRETE***
RETE does not Granger Cause INF	***2.8684****(0.0736)	***RETE INF***
RRETE does not Hranger cause INF	***3.7125*****(0.0371)	***RRETE RCETE***
SEDU does not Granger Cause RCETE	***3.4224*****(0.047)	***SEDU RCETE***
INF does not Granger Cause PRI	***3.6157*****(0.0401)	***INF PRI***

***significant at 10%, **significant at 5% and ***significant at 1%**
Source: Author's computation

4.4 Diagnostics Test

4.4.1 Autocorrelation Test Using *Breusch-Godfrey Serial Correlation LM Test*

We estimated lm test to check if there autocorrelation. The result however indicates that both F* and Obs. R^2 are far higher than 5% level of significance which means there is no serial correlation among the variables

Table 5: Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	**0.267603**	***Prob. F(2,20)***	***0.7679***
Obs*R-squared	**0.886138**	***Prob. Chi-Square(2)***	***0.6421***

Source: Author's computation

4.4.2 Heteroskedasticity Test

The prob values are 0.6796, 0.5941 and 0.2868 which are above 5% level of significance, we cannot reject the null hypothesis, but we accept it and conclude that the model is homoskecdastic.

Table 6: ***Breusch-Pagan-GodfreyHeteroskedasticity Test:***

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	***0.753232***	***Prob. F(11,22)***	***0.6796***
Obs*R-squared	***9.301751***	***Prob. Chi-Square(11)***	***0.5941***
Scaled explained SS	***13.10139***	***Prob. Chi-Square(11)***	***0.2868***

Source: Author's computation

4.5 Stability Test

The study uses the cumulative sum of recursive residuals (CUSUM) test to assess parameter stability (Pesaran and Pesaran, 1997). Fig 3 and 4 plots the results for CUSUM and CUSUMSQ tests. The results indicate the absence of any instability of the coefficients because the plots of the CUSUM statistic fall inside the critical bands of the 5% confidence interval of parameter stability.

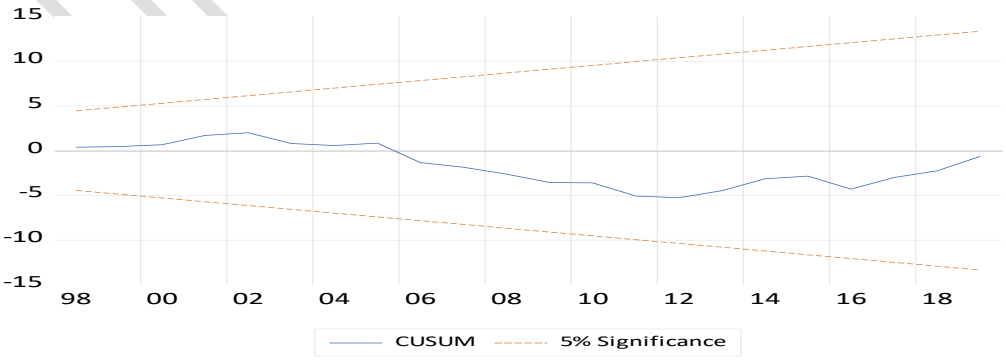

Figure 3 CUSUM

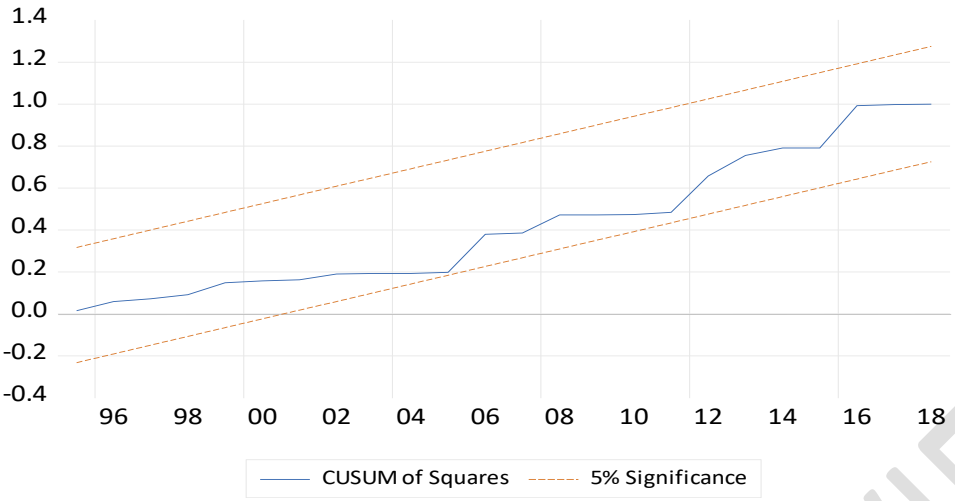

Figure 4: CUSUM sum of squares

4.6 Empirical Results and Discussion of Findings

The study adopts bound test co-integration because of integration in mixed order of the variables. Hence the result shows that a co-integration exist among the variables. This outcome corroborates the findings of Muhammad and Benedict (2015) and Omojimite (2010) but against the findings of Obi and Obi (2014).

In the long run, RRETE, RCETE and Inflation have direct relationship with GDPR while RETE, SEDU and PRI have inverse influence on GDPR. Statistically, only RRETE has a long run causal effect on GDPR. The positive and significant association between RRETE and RCETE is in tandem with the findings of Ayeni and Omobude (2018); Antonia (2012) and Urhie (2014), but against the outcome of Oladimeji (2016).

The short run result indicates that RETE and PRI have direct relationship with GDPR while RRETE and RCETE are inversely related to GDPR. However RETE and RCETE are significant at 10% level of significance while PRI is significant at 5% level of significance. This outcome is in line with the results of Idrees and Saddiqi (2013) and Mallick, Das and Pradhan (2016) but against the findings of Jelilov, Alenshinloye and Onder (2016).

The adjustment term (ECM) 1.06 implies that reversion to long run equilibrium is at an adjustment speed of about 106 percent. Finally, the granger causality test reveals that a unidirectional causality exist between SEDU and RETE, PRI and RETE, PRI and RRETE, RCETE and RETE, RETE and INF, RRETE and RCETE, SEDU and RCETE, INF and PRI.This attunes to the findings of Omojimite (2010) and Inimino, Tubotamun and Shaibu (2017), but

against the outcome of Muhammad and Benedict (2015) who found no causality among the variables.

5.0 Conclusion and Recommendations

The study examines the effect of public education funding on economic growth in Nigeria from 1985 to 2019. The paper employed Auto-Regressive Distributed Lag co-integration technique, Error correction mechanism and granger-causality tests for data analysis. The study concluded that recurrent and capital expenditure on education in Nigeria is crucial to the development of the education sector on the long run which stimulates economic growth in Nigeria. Meanwhile public education expenditure retard economic growth, this could be attributed to the inefficiency and ineffective government funding to education sector in Nigeria. The study further revealed that secondary and primary school output were unproductive to growth of Nigeria economy. The efficacy of the short-run result outcome is sustainable on the long-run expectation with the established significant positive impact of public expenditure on education, primary school output and economic growth in Nigeria. Based on the findings of this paper, the study recommended policies to meet UNESCO target funding ratio for recurrent and capital expenditure on education sector in order to have a meaningful contribution to economic growth in Nigeria. Direct funding of secondary and primary education system should be targeted as a basic background to acquire productive skills and knowledge for economic growth and development in Nigeria.

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