

Analysis of Effects of Government Education Expenditure and School Attainment on Per Capita Income in Nigeria

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Abstract

Not much empirical attention has been focused on the effects of government education expenditure and school attainment on per capita income in Nigeria. Therefore, this paper examined the effects of government education expenditure and school attainment on per capita income in Nigeria from the period 1990-2018. The variables used are: per capita gross domestic product, literacy rate, school enrolment rates for primary, secondary and tertiary education. The data were sourced from the Central Bank of Nigeria(CBN) Statistical Bulletin, the Nigerian Bureau of Statistics(NBS) and World Bank Development Indicator (2019). The variables were estimated using the dynamic autoregressive distributed lag approach(ARDL). The findings showed that gross fixed capital formation, government capital expenditure on education, secondary school enrolment ratio, tertiary school enrolment ratio and adult literacy rate had significantly positive effects on GDP per capita while labour force and primary school enrolment ratio had negative effects on GDP per capita. The results also revealed that Government recurrent expenditure were negatively related to GDP per capita in the short-run and positively related to GDP per capita in the long-run. The policy implications of the findings were discussed. The paper, therefore, recommended that the Nigerian government should: revise the current education curriculum so as to produce self-employable graduates and increase its budgetary allocation to education in line with the 26 percent benchmark of the United Nations Educational, Scientific and Cultural Organization (UNESCO) for developing countries.

Keywords: Government Education Expenditure, School Attainment Rate, MRW Theory, Per Capita GDP, ARDL, Nigeria.

Introduction

Education has been identified as a catalyst for economic growth and sustainable development of any nation. It is regarded as the greatest investment a nation can make for

fast and holistic development. This is because it enhances the skills, knowledge, productivity and inventiveness of people through the process of human capital formation (Adebayo, 2006; Tayo & Chukwuedozie, 2013; Olanipekun, Brimah & Rabi, 2015; Pankaj & Chitralkha, 2016). This brings about efficiency in the utilisation of natural resources, physical capital, technological innovation and quick diffusion of new technology which improves economic growth (Nelson & Phelps, 1966). This implies that economic growth and development cannot take place if the human capital (skilled persons) required to bringing about progressive changes in the economy is inexistent. In view of this, Okafor, Jegbefumwen and Ike (2016) states that investment in human capital leads to increase in human development, economic growth and development (poverty reduction, sustenance, freedom, equality, progress, self-esteem). Psacharopoulos (1973); Coombs (1985) opined that increase in national income and per capita income is a function of education and that differences among nations can better be explained by differences in the endowments of human, rather than physical capital. Nigeria as a nation must acknowledge that human development is a holistic affair and is closely linked to longevity (health and wellbeing), knowledge (education) and living standards (income). Without human development (however defined), Nigeria's participation in global competitiveness will be a mirage. Interestingly, that well trained, skilled, and healthy labour force that we advocate, must be derived from adequate funding of education and massive school enrolment at all levels. Quality education requires quality infrastructure, excellent and well remunerated teachers, adequate curriculum development and planning amongst others. These factors are derivatives of educational funding. It is educational funding that will determine quantity and quality of education (*ceteris paribus*), efficiency, and diversification. In other words, it's the quality, efficiency and the delivery that will define the outcome.

Several studies have highlighted the complementarity of human capital and physical capital, emphasizing more on how human capital affects economic growth (Psacharopoulos & Maureen, 1985; Schultz, 1999). Psacharopoulos & Maureen estimated education's contribution to economic growth in 29 developing countries from less than 1% in Mexico to 23% in Ghana. The study of Schultz among others, incited series of growth studies which points to education's contribution to economic growth of several economies. Other studies have estimated the private rate of returns to investment in education (Becker, 1964; Mincer, 1974). These studies have shown that sustainable development in any economy depends on the availability of skilled labour force whose contribution to increased labour productivity and long-term economic growth are essential for poverty reduction and longevity. Apart from its contribution to economic growth, education is a consumption good whose acquisition directly contributes to people's well-being. The rationale why the United Nations Development Program (UNDP) included education as one of the components of its Human Development Index (HDI). Motivated in part by these observations, findings from several studies focusing on education and national development suggest that education is a key to delivering the knowledge requirements for economic development (Hanushek & Kimko, 2000; Keller, 2006; McMahan & Oketch 2013; Appiah, 2017).

The first motivation of this paper is the need to provide an empirical approach to achieving sustainable gross domestic product (GDP) and per capita GDP growth rates in Nigeria through provision of quantity and quality education. Successive governments in Nigeria have enacted policies and introduced programmes geared toward ensuring that the education sector contributes positively to economic growth. Such efforts include but not limited to: establishment of National Commission for Mass Literacy, Adult and Non-formal Education; the National Minimum Standards and Establishments of Institution Amendments

Decree No. 9 which provides for religious bodies, non-governmental organisations and private individuals to participate in the provision of tertiary education; the Free Universal Basic Education (UBE) Act No. 66 of 2004 which comprehensively addressed the lapses of the Universal Primary Education (UPE); the provision of Early Childhood Care Development and Education (ECCDE) Centres and the issues of access, equality, equity, inclusiveness, affordability and quality (UNESCO, 2010). Others include, the National Economic Empowerment and Development Strategy (NEEDS) which emphasised greatly on education as a veritable tool for development, and the National Policy on Education (NPE) which has witnessed some revisions since its enactment in 1977. The latest revision brought the 9-3-4 (that is, 9 years of basic education comprising 6 years in primary and 3 years in junior secondary education, 3 years in senior secondary and 4 years in tertiary education) formal education system which replaced the defunct 6-3-3-4 (that is, 6 years in primary school, 3 years in junior secondary, 3 years in senior secondary and 4 years in tertiary) system. Sule and Bawa (2012) noted that this new system took off in 2006. The aim of this new system is to raise literacy level in Nigeria as well as prepare the individual to contribute meaningfully to productive activities. It is ironical, however, that despite these policy interventions and programme implementations, the full potential of education as a vehicle for economic growth and sustainable development seems not to be realised. For instance, a critical look at Nigeria's performance in terms of education funding, school enrolment rates, curriculum development, teaching, learning and research facilities, and literacy rate presents a dismal picture. Even in the comity of African nations, Nigeria lags behind in terms of these education indices. For example, the trend indicators showed that while gross primary school enrolment rate in Nigeria was 86.26% in 1990, it was 110.15%, 67.22%, 92.08%, 111.78% and 97.31% in Lesotho, Morocco, Algeria, Mauritius and Cameroon respectively. By 2015, that of Lesotho, Morocco, Algeria, Mauritius and Cameroon was 105.52%, 114.71%, 116.15%, 103.04% and 117.13% respectively whereas that of Nigeria only limped to 92.05% (Figure 2.1). At secondary level, gross enrolment rate in Nigeria only witnessed a gradual rise from 24.6% in 1990 to 45.5% in 2014 while those of Lesotho, Egypt, Mauritius and Cameroon experienced a sharp rise from 25.29%, 75.26%, 52.41% and 25.45% to 52.17%, 86.1%, 97.94% and 56.43% respectively (Figure 2.2). Nigeria's record in terms of school enrolment at tertiary level is not better than its position at lower levels. For instance, her gross tertiary school enrolment rate increased from 4.27% in 1990 to 21.08% in 2014 while those of Morocco and Mauritius rose from 10.26% and 3.04% to 25.12% and 38.67% respectively (Figure 2.3). Further, adult literacy rate in Nigeria grew from 53.91% in 1990 to 64.36% in 2015 whereas that of South Africa rose from 82.40% in 1996 to 94.36% in 2015 (Table 2.1). Low budgetary allocation to the education sector highlights Nigeria's poor education funding. For instance, in the past two decades, the highest budgetary allocation to the education sector out of the total budget was 13% in 2008 (Table 2.2). This falls short of United Nations Educational, Scientific and Cultural Organization (UNESCO) prescription of at least 26% allocation of total budget to education sector in developing countries. These poor education indices in Nigeria tend to limit the actualisation of the full potentials of formal education as a tool for sustainable economic growth. This is evident in figure 1.1 which shows a rising and falling trends in the annual growth rates of GDP and per capita GDP. The growth rates of GDP and per capita GDP dropped from 11.7% and 8.9% in 1990 to -2.0% and -4.4% in 1994 respectively. The GDP and per capita GDP growth rates rose to 15.3% and 12.4% in 2002 and declined to -1.6% and -4.1% in 2016 respectively. Since then, the growth rate of GDP has remained below 2% while that of per capita GDP has remained negative. It is really a paradox that while East Asian economies (Such as Hong Kong,

South Korea, Indonesia, Malaysia, Singapore, Taiwan and Thailand) succeeded in attaining sustained growth with institutional and technological reforms, the Nigerian economy has failed to achieve sustained growth despite its educational policy reforms. This calls for serious concern and raises an urgent need to investigate the impact of education on growth of the economy for proper policy guide.

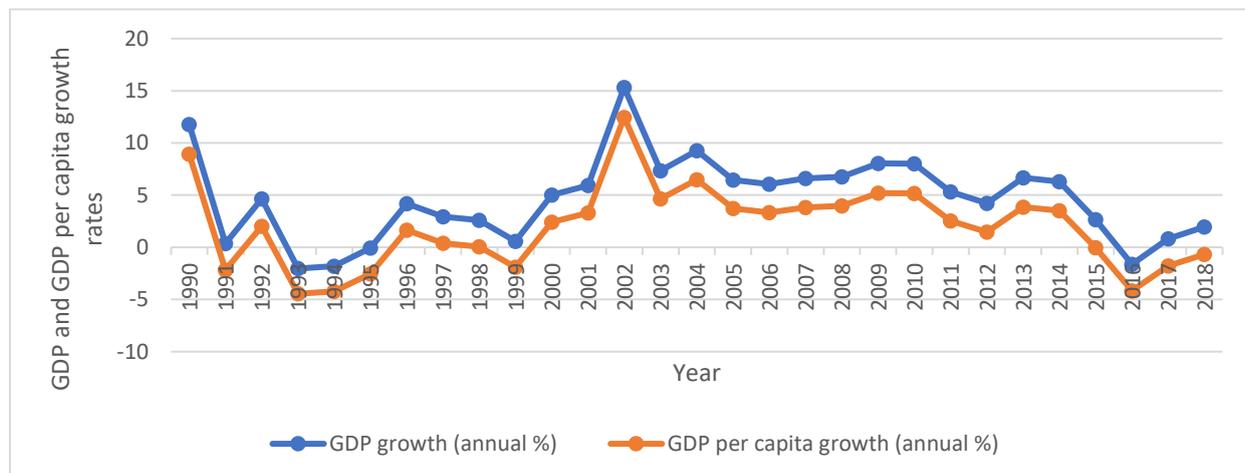


Figure 1.1: Growth rates of GDP and per capita GDP in Nigeria (1990-2018)

Source: WDI(2019)

The second motivation for this paper is fill the gap identified in the literature. The empirical literature review indicates that the subject matter of education-economic growth nexus has witnessed numerous research interests in developing countries including Nigeria. But most of existing empirical studies such as Owoye and Adenuga (2005), Dauda (2009), Lawal and Wahab (2011), Hussin, Muhammad, Hussin and Razak (2012), Odeleye (2012), Ehigiamusoe (2013), Kaul, Baharom and Habiullah (2014), Otieno (2016), and Omodero and Azubike (2016) have focused on one aspect of education growth nexus or the other and none has investigated the impact of education on per capita gross domestic product (GDP) in Nigeria. Again, none of the existing studies covers all the four vital aspects of formal education including government capital and recurrent expenditures on education, demand for formal education in terms of primary, secondary and tertiary school enrolment rates, quality of formal education in terms of literacy rate in Nigeria and changes in national policy on education. This study expands the literature by building a more robust model that fills these gaps. Thus, the objective of this research study is to determine the impact of government capital and recurrent expenditures on education, primary, secondary and tertiary gross school enrolment rates, adult literacy rate and latest revisions of national policy on education (NPE) on per capita GDP in Nigeria.

The remainder of this paper is structured into four sections. Following this introduction is section 2 which dwells on the review of related literature; section 3 describes the theoretical framework and methodology. Section 4 presents and discusses the results of the estimated model. Section 5 concludes the study and makes policy recommendations.

Review of Related Literature

Concepts of Education, School Enrolment, Literacy Rate and Economic Growth

Education is a way of imparting or possessing general knowledge, developing the powers of reasoning and judgment, and to prepare oneself or others intellectually,

psychologically and socially for a mature and responsible life style (Omodero & Azubike, 2016). Education is the process that facilitates learning, or the acquisition of knowledge, skills, values, beliefs, and habits. Educational methods include storytelling, discussion, teaching, training, and directed research (Dewey, 1944). Prosser and Ahmed (1973) noted that formal education is the hierarchically structured, chronologically graded 'education system', running from primary school through the university and including, in addition to general academic studies, a variety of specialised programmes and institutions for full-time technical and professional training. According to Novosadova, Gulece and Piskunowicz (2012), formal education is typically provided by formal education institutions and is sequentially and hierarchically structured leading to certification. It is imperative to note at this point that the focus of this study is on formal education. Formal education in Nigeria comes under various categories. The vital ones related to this study include basic education, secondary education and tertiary education. Under the latest revision of school system which took off in 2006, national policy on education restructured these 3 levels of education into 9-3-4 system which replaced the defunct 6-3-3-4 system. The 9-year basic education programme now comprises of 6 years of primary and 3 years of junior secondary education aimed at eradicating illiteracy, ignorance and poverty. It is designed to engender accelerated national development, political consciousness and national integration. The Universal Basic Education Commission (UBEC) is the government parastatal that coordinates the disbursement of federal allocation (2% of Consolidated Revenue Fund) to basic education and monitors UBE programme implementation (FME, 2017). The 3-year Senior Secondary School also known as Post-Basic Education occupies a critical position in Nigeria's education system as its structure is both academic and vocational, which plays dual role of preparing students for tertiary education and the labour market. The next is 4 years of tertiary education though some courses last more than 4 years; but the minimum benchmark is 4 years. Tertiary education in Nigeria which includes education at Universities, Polytechnics, Monotechnics, Colleges of Education and other institutions of higher learning is offered after secondary and vocational education. Whereas tertiary education is largely the responsibility of Federal and State Governments, individuals and organisations also participate. But Federal Government through its agencies such as the National Universities Commission (NUC) for universities, National Board for Technical Education (NBTE) for polytechnics and National Commission on Colleges of education (NCCE) for colleges of education are responsible for regulating these institutions.

School enrolment refers to the size or quantity of school attendance (Carsamer & Ekyem, 2015). Gross enrolment ratio is the ratio of total enrolment regardless of age, to the population of the age group that officially corresponds to the level of education concerned (UNESCO Institute for Statistics). This study makes use of primary, secondary and tertiary percentage of gross enrolment rates. Literacy popularly refers to the ability to read and understand. It is an ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts (UNESCO, 2006). This study makes use of adult literacy rate which refers to percentage of persons aged 15 and over who can read and write as defined by UNICEF (2001). Obviously the higher the literacy rate the better a country's growth prospects.

Economic growth simply refers to an increase in aggregate output or an increase in real incomes, in which the increase is usually calculated per capita or over a long period as a result of increased use of inputs. Per capita GDP refers to average output per head. That is total economic output (GDP) divided by the country's total population. It is an important indicator of economic performance and a useful unit to make cross-country comparisons of

average living standards and economic wellbeing. Notwithstanding, per capita GDP is not a measure of personal income and using it for cross-country comparisons has its weaknesses as it does not take into account income distribution in a country. Further, cross-country comparisons based on the US dollar can be distorted by exchange rate fluctuations and do not often reflect the purchasing power in the countries being compared. One way of eliminating this later problem is by expressing per capita GDP in purchasing power parity (PPP).

Stylized Facts on Formal Education Indices in Nigeria and Comparator African Countries

This sub-section is devoted to brief comparative analysis of primary, secondary and tertiary school gross enrolment rates and adult literacy rate between Nigeria and selected African countries. Gross enrolment ratio is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Also, government budgetary allocation to education sector and trend analysis of adjusted net savings excluding particulate emission damage (proxy for SD) and selected macroeconomic variables are presented. An overview of these variables has been provided in Figures 2.1, 2.2, and 2.3 with emphasis on their growth trend.

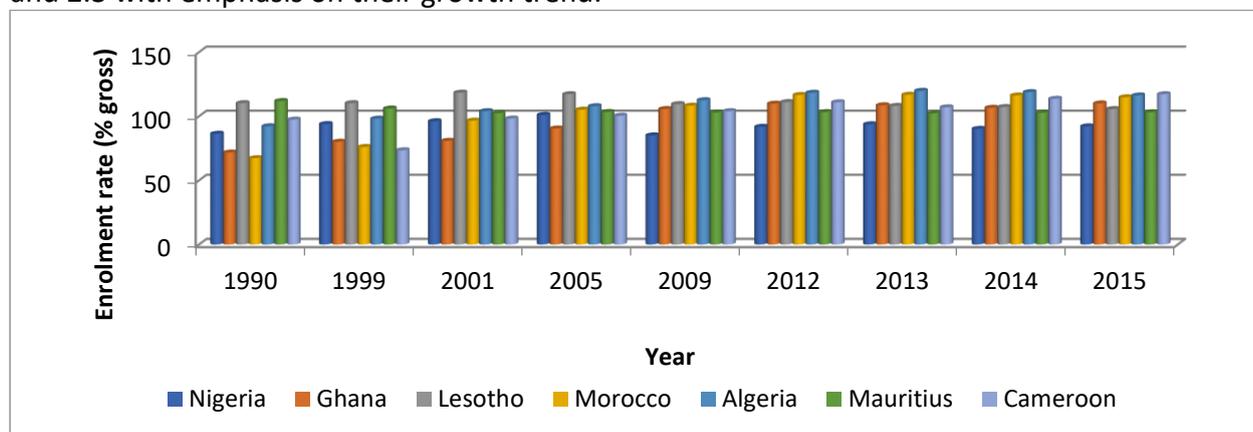


Fig 2.1: Comparative analysis of primary school enrolment rate (% gross) among selected African countries

Source: UNESCO Institute for Statistics and WDI, 2019

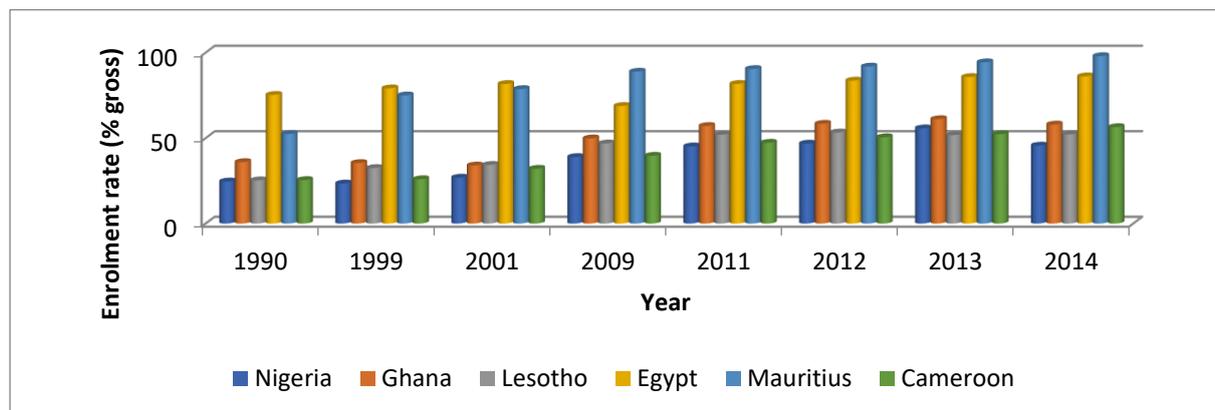


Fig 2.2: Comparative analysis of secondary school enrolment rate (% gross) among selected African countries

Source: UNESCO Institute for Statistics and WDI, 2019

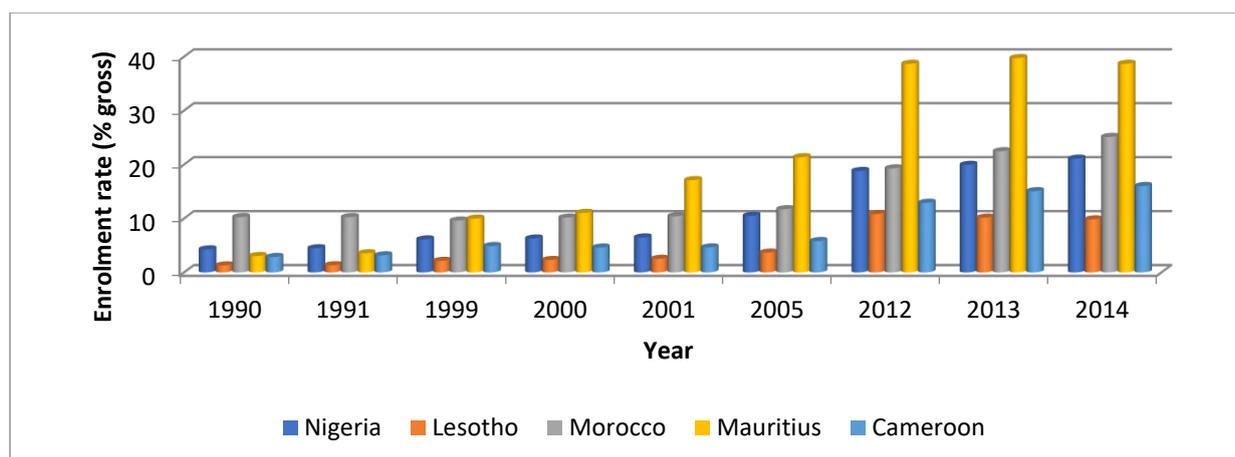


Fig 2.3: Comparative analysis of tertiary school enrolment rate (% gross) among selected African countries

Source: UNESCO Institute for Statistics and WDI (2019)

Table 2.1

Comparative analysis of adult literacy rate among selected African countries (1990-2015)

Countries	Years 1990	1994	1999	2004	2005	2008	2010	2012	2014	2015
Egypt	55.58 _b	66.36 _d	na	na	71.40	71.40	72.04	73.86	75.6 ^h	na
Morocco	41.59 _a	na	na	52.30	na	55.14	56.08 _f	69.42	67.08 _g	na
Nigeria	53.91	50.78	53.10	54.77	55.5	51.07	60.82	61.65	63.58	64.21
South Africa	82.40 _b	88.71 _e	92.89 _f	na	na	93.10 _g	92.87	93.13	94.13	94.36
Zambia	64.00	na	68.00	69.14 _c	na	61.4 ^e	2010	na	na	na

Source: Compiled by the authors from UNESCO Institute for Statistics (UIS) and WDI (2019)

Note: a = 1994; b = 1996; c = 2002; d = 2006; e = 2007; f = 2009; g = 2011; h = 2013; na = unavailable

The above education indices indicate that Nigeria has not fared well in the league of African nations in terms of formal education. Though some of the indicators show an upward trend, much needs to be done if Nigeria wants to improve the stock and quality of its human capital which is a key factor in the pursuit of sustainable economic growth and development. The budgetary allocation to education sector is presented in Table 2.2.

Table 2.2

Nigeria budgetary allocation to education sector as % of total budget (1999-2018)

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
% Allocation	11.12	8.36	7.00	5.9	1.83	10.5	9.3	11.00	8.09	13.00
Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
% Allocation	6.54	6.40	1.69	10.0	8.70	10.6	11.5	6.07	6.00	7.04

Source: Compiled by the authors from Federal Government yearly budgets

Table 2.2 shows that the highest budgetary allocation to education sector in the past 2 decades was in 2008 when 13% was allocated to education which falls below the UNESCO minimum benchmark of 26%. This highlights the importance of increased education funding to improve the quality of education outputs. Figure 2.4 shows trends of GDP per capita and selected socioeconomic variables and their relationships.

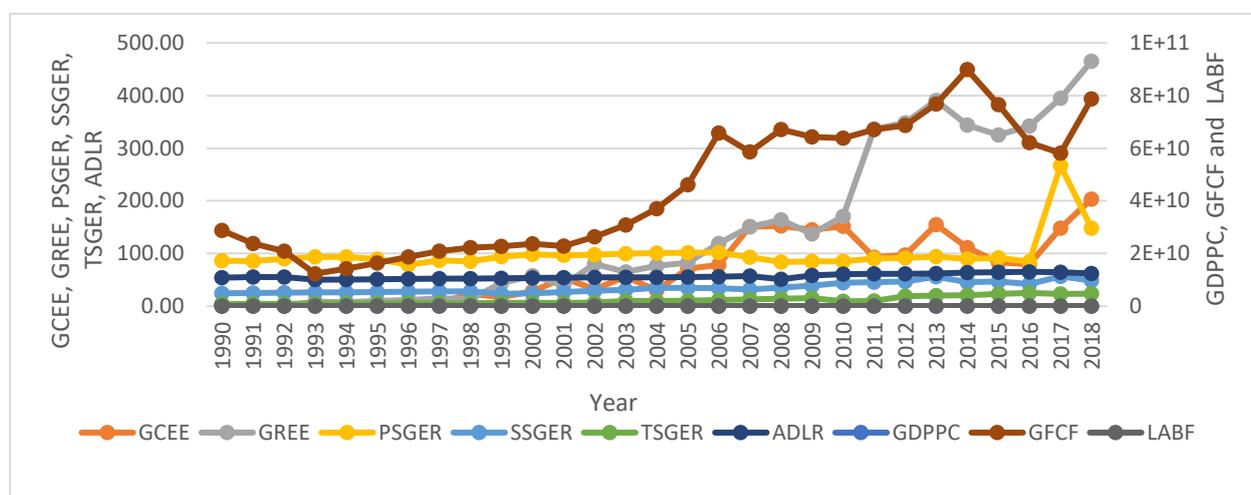


Fig 2.4: Trends of GDPPC and selected macroeconomic variables

Source: CBN Statistical Bulletin (2019), UNESCO Institute for Statistical and WDI (2019)

Empirical Review

The impact of human capital development through education on economic growth of countries has attracted several research interests. For instance, Owoeye and Adenuga (2005) investigated the relationship between economic growth and human capital development in Nigeria using time series data spanning 1970 to 2003 and error correction model. The findings showed that investment in human capital, through the availability of infrastructural requirements in the education sector promotes economic growth. The study concludes that there can be no significant economic growth in any economy without adequate human capital development. Dauda (2009) examined the relationship between investment in education and economic growth in Nigeria, using error correction model and annual time series data spanning 1977 to 2007. The cointegration results indicated long run relationship between economic growth and investment in education. The ECM results showed that gross fixed capital formation and capital expenditure on education are significant while labour force was statistically insignificant. Based on the findings, the study recommends for increase in educational investment in order to accelerate growth and economic development. Lawal and

Wahab (2011) examined the relationship between education and economic growth in Nigeria using ordinary least squares technique and time series data of annual frequency covering the period of 1980 and 2008. Findings indicated that education investments have direct and significant impact on economic growth in Nigeria. The study concludes that human capital plays pivotal role in achieving sustainable economic growth; and that investment in the quality and quantity of education is the greatest contribution. The study therefore recommends that government at all levels should increase their funding at different levels of education in the country. Hussin, Muhammad, Hussin and Razak (2012) examined the long run relationship and causality between government expenditure on education and economic growth in the Malaysian economy using annual time series data for the period 1970 to 2010 and vector autoregression (VAR) data analysis technique. Findings revealed that economic growth proxied by GDP is cointegrated with fixed capital formation (CAP), labour force participation (LAB) and government expenditure on education (EDU). With regard to the Granger causality relationship, it was found that in the short run, economic growth Granger cause education variables and vice versa. The study concludes that human capital development through education plays an important role in influencing economic growth in Malaysia. Odeleye (2012) investigated the impact of education on economic growth in Nigeria using OLS technique and time series data on primary and secondary school enrolment rates, government recurrent and capital expenditure, and GDP from 1985 to 2007. The results indicate that only recurrent expenditure impacted significantly on GDP while the academic qualifications of teachers also have significant impact on students' academic performance. The paper recommends that the government should increase its expenditure on education especially, the capital expenditure, and package a good salary scheme with other incentives for teachers. Ehigiamusoe (2013) examines the interrelationships among education, economic growth and poverty in Nigeria. The study adopts OLS – ECM econometrics methodology as the analytical tool using secondary data of annual frequency from 1980-2012. The results of the model which expressed RGDP as being dependent on labour force (L), physical capital (K), human capital proxied by tertiary school enrolment (HK), total education expenditure (EDEX), and adult literacy (LITR) showed that all the variables impacted positively on growth in the long run; while K, HK and EDEX were significant, L and LITR were insignificant. In the short run, K, HK and EDEX impacted significantly positive on RGDP whereas two period lagged values of L and EDEX impacted insignificantly positive; two period lagged value of K has insignificantly negative impact and one period lagged value of EDEX were positive but insignificant. The results of granger causality tests indicated no causality between literacy rate and labour, total education expenditure and labour, poverty rate and total education expenditure, as well as human capital and education expenditure. Pegkas (2014) estimated the impact of the different educational levels on economic growth in Greece over the period 1960 – 2009 by applying the Mankiw, Romer and Weil (1992) model and employing cointegration and error-correction models. The empirical results indicated that there is a long-run relationship between educational levels and gross domestic product. The overall results revealed that secondary and higher education made statistically significant positive impact on growth whereas primary impacted negatively on economic growth. The results also suggested that there is evidence of unidirectional long-run causality running from primary education to growth, bidirectional long-run causality between secondary and growth, long-run and short-run causality running from higher education to economic growth. Kaul, Baharom and Habiullah (2014) examined linkages between education expenditure and economic growth in China and India using ordinary least square (OLS), dynamic ordinary least squares (DOLS)

techniques and vector error correction model (VECM) and annual time series data covering the period of 1970 to 2005. The result of the model which specified GDP per capita as a function of education expenditure (EDUEXP) in both countries revealed a unidirectional causal relationship for both countries running from GDP to expenditure for the case of China and vice versa for India. The OLS, DOLS and VECM results showed that both variables - EDUEXP and GDP impacted positively but insignificantly on each other for both countries under the three estimation techniques. The study recommends that more emphasis should be given to formulating important policies regarding education expenditure, since this study as well as many past studies have shown that education could be an important engine of growth for an economy. Otieno (2016) examined the role of educational investments on economic growth and development in Kenya using error correction model and annual time series data covering 1967-2010. The results of the model which specified RGDP as a function of GFCF, labour force (L) and education expenditure per worker in Kenya (EW) revealed that EW and GFCF have positive and significant impact on economic growth both in the long run and short run while L impacted negatively. Granger causality tests indicate that GFCF, L and EW were significant in affecting RGDP. Causality runs from these three variables to GDP. Omodero and Azubike (2016) empirically examined the relationship between government expenditure on education and economic development in Nigeria from 2000–2015 using time series data and multiple regression analysis. The result of the model which expressed GDP as a function of government expenditure, social and community services and school enrolment revealed that all three variables impacted positively and significantly on GDP. The study concludes that if the resources allocated to education sector are efficiently utilized to equip government owned schools, education will be affordable by all and number of schools drop-outs will reduce significantly. The study therefore recommends that the anti-graft fight by the present government to encourage proper use of allocated funds has to be encouraged by all good citizens and lovers of education. Appiah (2017) investigated the effect of education expenditure on per capita GDP in developing countries and whether its impact is different from that of Sub-Saharan Africa (SSA) using the two-step system general method of moments (GMM) estimator and panel data of 139 countries spanning 1975 to 2015. The results of the model which expressed per capita GDP as a function of education expenditure, labour force, gross primary school enrolment, gross secondary school enrolment and annual export growth indicated that expansion of education expenditure has a positive effect on per capita GDP. The study found no significant difference in the impact of education expenditure on per capita GDP in developing countries and SSA countries though the magnitude of the impact is higher in developing countries than that of SSA countries. The study acknowledged that SSA countries annual export growth is relatively higher than that of other developing countries but they lack the necessary human capital that can add value to their produce and recommended that they improve their level of human capital to make a significant impact on per capita GDP.

The empirical literature reviewed indicate that the subject matter of education-economic growth nexus has witnessed numerous research attention in developing countries including Nigeria. But most of existing empirical studies such as Owoeye and Adenuga (2005); Dauda (2009); Lawal and Wahab (2011); Hussin, Muhammad, Hussin and Razak (2012); Odeleye (2012); Ehigiamusoe (2013); Kaul, Baharom and Habiullah (2014); Otieno (2016); and Omodero and Azubike (2016) have focused on one aspect of education growth nexus or the other and none has investigated the impact of education on per capita GDP in Nigeria. Thus, none of the existing studies covers all the four vital aspects of formal education including

government capital and recurrent expenditure on education, demand for formal education in terms of primary, secondary and tertiary school enrolment rates, quality of formal education in terms of literacy rate in Nigeria and national policy on education. This study expands the literature by building a more robust model that fills these gaps.

Methodology and Data

Theoretical Framework/Model

This paper is anchored on the augmented Solow - Swan neoclassical growth model created by Mankiw, Romer and Weil (1992) which integrates human capital into the production function and additional transition equation for adjustment of the stock of human capital and then obtains the steady-state values for physical capital (k) and human capital (h). In this extended model, output and marginal product of capital (K) are higher in rich countries because they have more human capital than poor countries. The augmented model is of the Cobb–Douglas production function:

$$Y(t) = K(t)^\alpha H(t)^\beta (A(t) L(t))^{1-\alpha-\beta} \quad 3.1a$$

where Y = output, K = capital, H = stock of human capital, L = labour, and A = the level of technology, t = time; with H depreciating at the same rate ' δ ' with physical capital. Assume that $sY(t)$ is part of income saved each period but is partly invested in physical capital (S_k) and partly in human capital (S_h) such that $sY(t) = S_k + S_h$. The above equation brings about two dynamic equations in the model:

$$k(t) = S_k y(t) - (n+g+\delta) k(t)$$

3.1b

$$h(t) = S_h y(t) - (n+g+\delta) h(t)$$

3.1c

Where $y = Y/AL$, $k = K/AL$, and $h = H/AL$ are quantities per effective unit of labour. Mankiw, Roma & Weil assumed that the same production function applies to human capital, physical capital, and consumption. It implies that, one unit of consumption can be transformed at zero cost into either one unit of physical capital or one unit of human capital. It is assumed also that human capital depreciates at the same rate as physical capital. Though Lucas (1988) models the production function for human capital differently from that for other goods. For an initial testing, Mankiw et al., opine that it is natural to assume that the two types of production functions are similar. It is assumed that $\alpha + \beta < 1$, which implies that there are decreasing returns to all capital. (If $\alpha + \beta = 1$, then there are constant returns to scale in the reproducible factors. In this case, there is no steady state for this model). That is the equilibrium path is determined by $\dot{k} = \dot{h} = 0$ which means $S_k k^\alpha h^\beta - (n+g+\delta) k = 0$ and $S_h k^\alpha h^\beta - (n+g+\delta) h = 0$. In the steady state of equilibrium, $y^* = (k^*)^\alpha + (h^*)^\beta$. For the purpose of this study, the augmented Solow- Swan model as specified by Mankiw, Romer and Weil (1992) is modified by adding our explanatory variables of interest and replacing $Y(t)$ with Per capita GDP.

Model Specification

Following the Cobb-Douglas production function and Appiah (2017). The model of the study is specified as follows:

$$GDPPC = f(GFCF, LABF, GCEE, GREE, PSGER, SSGER, TSGER, ADLR, NPE) \dots \dots \dots (3.2a)$$

Where GDPPC = per capita gross domestic product, GFCF = gross fixed capital formation, LABF = labour force, GCEE = government capital expenditure on education, GREE = government recurrent expenditure on education, PSGER = primary school gross enrolment rate, SSGER =

secondary school gross enrolment rate, TSGER = tertiary school gross enrolment rate, ADLR = adult literacy rate, NPE = dummy used to proxy national policy on education which captures the impact of changes in education policy in Nigeria. The parameterized version of equation 3.2a is presented in equation 3.2b as:

$$GDPPC_t = \lambda_0 + \lambda_1 GFCF_t + \lambda_2 LABF_t + \lambda_3 GCEE_t + \lambda_4 GREE_t + \lambda_5 PSGER_t + \lambda_6 SSGER_t + \lambda_7 TSGER_t + \lambda_8 ADLR_t + \lambda_9 NPE_t + \mu_{1t} \dots (3.2b)$$

Where the variables are as itemized above; λ_0 is the constant while $\lambda_1 \dots \lambda_9$ are the coefficients of the parameters; t is a subscript denoting time. Based on a priori, $\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5, \lambda_6, \lambda_7, \lambda_8, \lambda_9 > 0$

The ARDL dynamic representation of equation 3.2b is specified in equation 3.2c as:

$$\begin{aligned} \Delta LNGDPPC_t = & \lambda_0 + \lambda_1 LNGDPPC_{t-1} + \lambda_2 LNGFCF_{t-1} + \lambda_3 LNLABF_{t-1} + \lambda_4 LNGCEE_{t-1} + \lambda_5 LNGREE_{t-1} + \lambda_6 LNPSGER_{t-1} \\ & + \lambda_7 LNSSGER_{t-1} + \lambda_8 LNTSGER_{t-1} + \lambda_9 LNADLR_{t-1} + \lambda_{10} NPE_{t-1} + \lambda_{11} BRK2001_{t-1} + LN \lambda_{12t-1} + \sum_{j=1}^k \psi_{1j} \Delta GDPPC_{t-j} \\ & + \sum_{j=0}^k \psi_{2j} \Delta GFCF_{t-j} + \sum_{j=0}^k \psi_{3j} \Delta LABF_{t-j} + \sum_{j=0}^k \psi_{4j} \Delta GCEE_{t-j} + \sum_{j=0}^k \psi_{5j} \Delta GREE_{t-j} + \sum_{j=0}^k \psi_{6j} \Delta PSGER_{t-j} + \sum_{j=0}^k \psi_{7j} \Delta SSGER_{t-j} \\ & + \sum_{j=0}^k \psi_{8j} \Delta TSGER_{t-j} + \sum_{j=0}^k \psi_{9j} \Delta ADLR_{t-j} + \sum_{j=0}^k \psi_{10j} \Delta NPE_{t-j} + \sum_{j=0}^k \psi_{11j} \Delta BRK2001_{t-j} + \mu_{1t} \dots (3.2c) \end{aligned}$$

Where ψ_1 to ψ_{11} are the coefficients of the short-run parameters, λ_1 to λ_{11} are the coefficients of the long-run parameters, Δ = first difference operator, LN denotes variables in their natural log form, K is the lag order selected by Akaike information criterion (AIC), TBK2001 is the dummy variable incorporated into the ARDL dynamic specification to capture the structural break observed in the GDPPC data in 2001, while μ_{1t} is the white noise assumed to be normally distributed.

Definition of Variables/Justification for the Model

Though not the major focus of this paper, GFCF and LABF are included in the model to avoid omission bias capable of introducing ‘spuriousity’ since they are indispensable factors in the adapted growth model. In fact, you cannot talk about economic growth without these two essential factors. The technology variable (A) is excluded from the model because Nigeria is a developing country without a well-developed technology. In fact, the result of the model becomes insignificant and suffers from many econometric problems when the technology variable proxy by the total mobile cell subscriptions in Nigeria is introduced into the model. GCEE, GREE, PSGER, SSGER, TSGER, ADLR and NPE are the core explanatory variables of the GDPPC based on the study interest. All the explanatory variables are expected to impact positively on GDPPC based on economic theory. A brief description of these variables and their data sources are presented in table 3.1. This paper used annual time series data spanning 1990 to 2018.

Table 3.1

Data description and sources

Variables	Description	Source
GDPPC	GDP per capita (current US\$)	WDI, 2019
GFCF	Gross fixed capital formation (current US\$)	WDI, 2019
LABF	Labour force, total	WDI, 2019
GCEE	Federal Government Capital Expenditure on Social Community Services (N' billion)	CBN, Statistical Bulletin, 2018
GREE	Federal Government Recurrent Expenditure on Education (N' billion)	CBN, Statistical Bulletin, 2018
PSGER	School enrolment, primary (% gross)	UIS and WDI, 2019
SSGER	School enrolment, secondary (% gross)	UIS and WDI, 2019
TSGER	School enrolment, tertiary (% gross)	UIS and WDI, 2019
ADLR	Literacy rate, adult total (% of people ages 15 and above)	UIS and WDI, 2019
NPE	Dummy (proxy for National Policy on Education)	Generated by the author

Source: Compiled by the authors. UIS = United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics; WDI = World Development Indicators, World Bank.

Estimation Technique and Procedure

This paper employed the auto-regressive distributed lag (ARDL) technique of Pesaran, Shin and Smith (2001) for the analysis of data. The ARDL is a dynamic regression process. The choice of this technique is because of its advantages over the traditional Johansen co-integration and Engle Granger static procedure. The Johansen co-integration accepts I(1) variables only but ARDL technique allows for a mixture of I(0) and I(1) variables for estimating short-run and long-run coefficients; and is more appropriate for small sample size ($n \leq 30$). But the ARDL technique becomes inappropriate if any of the variables is of I(2), because bounds test to co-integration is not applicable to I(2) and higher order variables. The ARDL is empirically more robust than the conventional time series approaches of Johansen. The ARDL technique is employed for this study because the variables are integrated of I(0) and I(1).

Subject to the fact that economic variables wonder about and are not stationary, the first stage in the empirical investigation was to analyse the time series properties of the data using the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) unit root tests (as specified in Dickey & Fuller, 1979; Philips & Perron, 1988). A random time series is said to be stationary if its mean and variance is constant over time and the value of covariance between two time periods depends only on the distance between the two time periods and not on the actual time at which the variance is computed (Gujarati, 2003). One way of removing non-stationarity is through the method of differencing (Uddin, Chowdhury & Hossain, 2014). The null hypothesis of the unit root test is stated as: $H_0 = \beta = 0$ (i.e. β has a unit root). But in the presence of structural breaks, the traditional ADF and PP unit root tests yield biased results due to their low explanatory power to reject the null hypothesis of unit root because they do not incorporate information about structural break dates as a result structural changes in the economic and political environment (Perron, 2006). Therefore, breakpoint test that detects unknown single structural break in time series data was also employed in order to overcome this problem. This test uses the basic framework outlined in Perron (1989); and Vogelsang and Perron (1998), and is conducted with the break years selected when Dickey-Fuller t-

statistic is at the minimum. The decision rule is that the ADF and PP tests statistics must be greater than the critical values at 1%, 5% or 10% in absolute terms before the variables can be confirmed stationary.

The second stage was to test for co-integration among the variables to determine whether long run relationship exists among the variables. This study adopts the ARDL bound test approach to co-integration test incorporating the NPE and the structural breaks observed in GDPPC data set as dummies because it has several desirable statistical features that overcome the shortcomings of other co-integration techniques (Pesaran et al., 2001); and has been widely used by researchers in recent years (Jayaraman & Choong, 2009). The ARDL bounds test to co-integration has been applied for the estimation of F-statistic, that determines whether a long run relationship exists for the data under study or not. The condition for the existence of cointegration is that the ARDL bounds test F-statistic value must be greater than the upper critical bound value at 5% significance level. If the calculated F-statistic is less than the lower bound, then there is no cointegration among the variables but if the calculated F-statistic remains between the lower and upper critical bounds then the decision is inconclusive.

The third stage was estimation of the short run and long run impact of the explanatory variables on GDPPC in Nigeria. The coefficient of the co-integration equation [CointEq (-1)] of the short-run result traditionally known as the error correction term (ECT) which is expected to be negative and significant measures the speed of adjustment of the model back to long-run equilibrium after disequilibrium which occurs in response to shocks (Ahmad, 2011). Specifically, it indicates the rate at which GDPPC adjusts to changes in the explanatory variables of the model. Thus, the greater the coefficient of the ECT, the higher the speed of adjustment of the model from short run to long run and vice versa.

The fourth stage was to conduct some residual diagnostic tests of model adequacy. Precisely, the study employed the Breusch-Godfrey serial correlation LM test, the Breusch-Pagan-Godfrey heteroskedasticity test, the Jarque-Bera test of normality, and the CUSUM and CUSUM of Squares tests of stability. The absence of serial correlation and heteroskedasticity is confirmed if the probability Chi-square values of the Observed R-squared and F-statistic values are more than 5% respectively. Whereas the condition for the existence of normality is that the probability value of the Jarque-Bera coefficient must be greater than 5%; that of stability is that the CUSUM and CUSUM of squares lines must appear within the acceptable region of the graph.

Analysis, Presentation and Discussion of Results

Presentation and Analysis of Results

The results presentation starts with the descriptive statistics and the correlation matrix. These aim at examining the characteristics of the variables of the model. The results are presented in Tables 4.1 and 4.2

Table 4.1

Descriptive statistics of the time series data

	GDPPC	GFCF	LABF	GCEE	GREE	PSGE	SSGER	TSGER	ADLR
Mean	1371. 921	4.43E +1	42929 15	68.938 97	144.9 42	99.49 61	35.07 91	11.43 40	56.61 95
Median	1007. 874	3.70E +1	41723 31	55.74 00	80.53 00	92.05 35	31.85 16	9.707 92	55.44 67
Maximum	3222. 694	8.98E +1	60698 49	203.4 20	465.3 00	266.8 15	56.59 24	25.21 00	65.33 99
Minimum	270.2 240	1.23E +1	29286 94	1.490 00	0.290 00	78.61 45	23.53 61	4.270 00	50.32 00
Std. Dev.	955.4 088	2.42E +1	93865 85.	60.98 10	150.3 99	34.34 76	9.968 21	6.966 57	4.678 31
Skewness	0.432 361	0.235 59	0.299 709	0.525 26	0.774 49	4.269 78	0.697 53	0.763 15	0.480 80
Kurtosis	1.706 776	1.519 48	1.937 904	2.013 00	2.083 75	20.98 97	2.279 37	2.145 44	1.879 07
Jarque-Bera	2.924 374	2.916 86	1.797 215	2.510 61	3.913 64	479.1 70	2.979 17	3.697 37	2.635 58
Probability	0.231 729	0.232 60	0.407 136	0.284 98	0.141 30	0.000 00	0.225 46	0.157 44	0.267 72
Sum	39785 .70	1.24E +0	1.24E+ 0	1999. 23	4203. 33	2885. 38	1017. 29	331.5 88	1641. 96
Sum Sq. Dev.	25558 56	2.47E +1	2.47E+ 1	10412 3.	6333 59.	3303 3.2	2782. 23	1358. 92	612.8 26
Observations	29	29	29	29	29	29	29	29	29

Source: Computed by the authors using Eviews 10.0

From Table 4.1, the skewness value of all the variables except PSGER mirror a normal distribution since for normal skewness the value is zero; and the skewness values of all the variables clusters around 0.23 and 0.77 except PSGER that is 4.26. The values of the kurtosis which measures the peakness or flatness of the distribution of a series indicate that all the variables except PSGER are clearly platykurtic since their values are less than 3. That means that these series have most of their values lower than their sample means. PSGER skewness value of 4.26 shows that it has a long right tail and is clearly leptokurtic since its kurtosis value of 20.98 is greater than 3. The probability values of the Jarque-Bera test statistic which measures the difference of the skewness and kurtosis with those from the normal distribution shows that all the variables except PSGER are normally distributed since their probability values are greater than 0.05 (5%). From the summary statistics, it can be inferred that the data are good for the analysis.

The correlation values in table 4.2 reveal absence of multicollinearity among the variables since the coefficients are less than 0.95.

Table 4.2

Correlation matrix among GDPPC and explanatory variables

	GDPPC	GFCF	LABF	GCEE	GREE	PSGER	SSGER	TSGER	ADLR
GDP		0.9717	0.8822	0.8186	0.8870	0.1432		0.8455	0.8370
PC	1	61	66	28	88	59	0.8892	25	31
	0.9717			0.8648	0.8764	0.1832	0.8625	0.8631	0.8219
GFCF	61	1	0.8952	95	43	15	48	39	07
	0.8822			0.8518	0.9506	0.4295	0.9186	0.9471	0.8783
LABF	66	0.8952	1	64	9	79	64	58	45
	0.8186	0.8648	0.8518			0.3586	0.8035	0.7707	0.6653
GCEE	28	95	64	1	0.7934	23	19	65	41
	0.8870	0.8764	0.9506			0.4246	0.9375	0.9231	0.8945
GREE	88	43	9	0.7934	1	56	15	94	08
PSGE	0.1432	0.1832	0.4295	0.3586	0.4246		0.4687	0.4098	0.3618
R	59	15	79	23	56	1	94	56	83
SSGE		0.8625	0.9186	0.8035	0.9375	0.4687		0.8722	0.8735
R	0.8892	48	64	19	15	94	1	23	67
TSGE	0.8455	0.8631	0.9471	0.7707	0.9231	0.4098	0.8722		0.8636
R	25	39	58	65	94	56	23	1	51
	0.8370	0.8219	0.8783	0.6653	0.8945	0.3618	0.8735	0.8636	
ADLR	31	07	45	41	08	83	67	51	1

Source: Computed by the authors using Eviews 10.0

The results of the ADF and PP unit root tests of stationarity and that of breakpoint are presented in Table 4.3 Panels A and B respectively.

Table 4.3

Results of unit root tests of stationarity

Panel A: Results of unit root tests without structural break						
Variables	ADF Test			PP Test		
	t- statistic I(0)	t- statistic I(1)	Result	t- statistic I(0)	t- statistic I(1)	Result
GDPPC	-0.525968	-4.051172***	I(1)	-0.598419	-4.051172***	I(1)
LNGFCF	-0.322938	-3.954294***	I(1)	-0.322938	-3.887821***	I(1)
LNLABF	2.233698	-2.930692*	I(1)	1.508456	-2.813828*	I(1)
LNGCEE	-2.192871	-7.422492***	I(1)	-1.676441	-7.422492***	I(1)
LNGREE	-4.163889***	-7.431800***	I(0)	-1.259455	-9.169124***	I(1)
LNPSGER	-3.219325**	-8.224194***	I(0)	-3.208476**	-8.224194***	I(0)
LNSSGER	-0.911213	-7.005420***	I(1)	-0.581516	-7.005420***	I(1)
LNTSGER	-0.541456	-5.576864***	I(1)	-0.066188	-9.554687***	I(1)
LNADLR	-1.111607	-6.227283***	I(1)	-0.923678	-6.491380***	I(1)
NPE	-1.628822	-5.196152***	I(1)	-1.618528	-5.196165***	I(1)

Panel B

Results of unit root test with unknown single structural break

	Level form I(0)		First difference form I(1)		Results
	t-Statistic	Break Date	t-Statistic	Break Date	
GDPPC	-2.905574	2001	-4.490238**	2014	I(1) with break
LNGFCF	-3.228289	2003	-5.483596***	2008	I(1) with break
LNLABF	-1.648795	2005	-3.957304*	2008	I(1) with break
LNGCEE	-2.599085	2017	-8.188739***	2001	I(1) with break
LNGREE	-4.647296**	2010	-9.396205***	2003	I(0) with break
LNPSGER	-5.321199***	2015	-22.07678***	2016	I(0) with break
LNSSGER	-2.868950	2008	-7.203939***	2016	I(1) with break
LNTSGER	-2.323077	2011	-7.603474***	2010	I(1) with break
LNADLR	-4.939835**	2008	-6.499955***	2010	I(0) with break
NPE	-1.540658	2017	-5.126960***	2008	I(1) with break

Source: Computed by the authors using Eviews 10.0; ***, **, * implies rejection of null hypothesis at 1%, 5%, or 10% level of significance.

The maximum lag length of 6 was automatically selected based on Schwarz information criterion (SIC). The results in Table 4.3 Panel A show that the variables are integrated of I(0) and (1). The null hypothesis of unit root is therefore rejected since the ADF and PP tests statistics are greater than the critical values at the indicated levels of significance. Thus GDPPC and the explanatory variables are stationary at I(0) and (1). The results in Panel B show a structural break in all the data series. For GDPPC, a structural break is found in the series in 2001 which is an indication that the economy has observed significant policy shocks at the selected break date. The breakpoint test is implemented with intercept; and the stationary properties validate the ADF and PP tests results of I(1) and I(0) in Panel A. The study moved on to verify whether the combination of the variables is cointegrated by employing ARDL bounds test. The lag length order selection criteria and the ARDL bounds test to cointegration results are presented in Tables 4.4 and 4.5 respectively.

Table 4.4

VAR lag order selection criteria for the model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	101.7483	NA	1.07e-14	-6.624876	-6.196668	-6.493969
1	367.4101	341.5652*	2.70e-20*	-19.81500	-15.53292*	-18.50593*

Source: Computed by the authors using Eview 10.0

* indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion. Lag one is selected based on the results in Table 4.4.

Table 4.5

Result of ARDL bounds test to cointegration

Test Statistic	Value	K
F-statistic	9.266386	8
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	1.95	3.06
5%	2.22	3.39
2.5%	2.48	3.7
1%	2.79	4.1

Source: Computed by the authors using Eviews 10.0

Based on the results in Table 4.5, the null hypothesis of no long run relationship is not accepted as the F-statistic value of 9.266386 is greater than the critical upper (I1) bounds values of 3.39 at 5% level of significance. This confirms the existence of cointegration or long run relationship among the variables. Having established the existence of long run relationship, short run and long run impacts of the explanatory variables on GDPPC are estimated. The results are presented in Table 4.6

Table 4.6

ARDL short run and long run results (dependent variable: GDPPC)

	Short run		result	
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGFCF)	0.667865***	0.142060	4.701283	0.0005
D(LNLABF)	-1.954102**	0.694039	-2.815550	0.0156
D(LNGCEE)	0.125395**	0.046456	2.699224	0.0193
D(LNGREE)	-0.012207	0.028503	-0.428284	0.6760
D(LNPSGER)	-0.133665	0.079362	-1.684244	0.1179
D(LNSSGER)	0.286671*	0.154048	1.860924	0.0874
D(LNTSGER)	0.066402	0.117425	0.565485	0.5822
D(LNADLR)	0.528506	0.549348	0.962060	0.3550
D(NPE)	-0.190061**	0.068496	-2.774791	0.0168
D(BRK2001)	-0.108451	0.080908	-1.340419	0.2049
CointEq(-1)	-0.851667***	0.139018	-6.126288	0.0001
	Long run		result	
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGFCF	0.784185***	0.117354	6.682201	0.0000
LNLABF	-2.294444**	0.912071	-2.515643	0.0271
LNGCEE	0.287535***	0.086000	3.343425	0.0059
LNGREE	0.083531	0.058195	1.435354	0.1767
LNPSGER	-0.362264***	0.118204	-3.064743	0.0098
LNSSGER	0.336600*	0.180228	1.867637	0.0864
LNTSGER	0.077967	0.131807	0.591525	0.5651
LNADLR	3.218893**	0.911637	3.530892	0.0041
NPE	-0.223164**	0.082550	-2.703363	0.0192
BRK2001	-0.127340	0.103725	-1.227670	0.2431

C	14.319663	13.525439	1.058721	0.3106
R-squared	0.997655	F-statistic	340.3993	
Adjusted R-squared	0.994724	Prob(F-statistic)	0.000000	
Durbin-Watson stat	2.338685			

Source: Computed by the authors using Eviews 10.0

***, ** and * denotes significant variables of the model at 1%, 5% and 10% significance levels respectively.

The results in Table 4.6 indicate that, in the short run, GFCF, GCEE and SSGER made positive and significant impact on GDPPC whereas TSGER and ADLR impacted insignificantly positive. Specifically, a unit increase in GFCF, GCEE, SSGER, TSGER and ADLR generates about 0.66, 0.12, 0.28, 0.06 and 0.52 US\$ billion increase in GDPPC respectively. Conversely, LABF made negative and significant impact on GDPPC while GREE and PSGER impacted insignificantly negative. Precisely, a unit increase in LABF, GREE and PSGER, leads to 1.95, 0.01 and 0.13 US\$ billion decline in GDPPC respectively. In the long-run, GFCF, GCEE, SSGER and ADLR made significantly positive impact on GDPPC whereas GREE and TSGER impacted insignificantly positive. Numerically, a unit increase in GFCF, GCEE, SSGER, ADLR, GREE and TSGER brings about 0.78, 0.28, 0.33, 3.21, 0.08 and 0.07 US\$ billion rise in GDPPC respectively. On the other hand, LABF and PSGER impacted significantly negative on GDPPC. Quantitatively, a unit increase in LABF and PSGER reduces GDPPC by 2.29 and 0.36 US\$ billion respectively. Uninterestingly, the NPE which introduced changes in the education system in Nigeria in 1998, and the structural break observed in GDPPC data set in 2001 impacted significantly negative and insignificantly negative respectively on GDPPC in both short run and long run. The two dummies (NPE and BRK2001) depressed GDPPC by 0.19 and 0.10 US\$ billion respectively in the short run; and by 0.22 and 0.12 respectively in the long run. The cointegration equation coefficient traditionally known as error correction term (ECT) is well behaved (significant and negatively signed). The ECT of 0.85 reveals that approximately 85% disequilibrium is corrected periodically to ensure convergence at the long-run. The R-squared coefficient of 0.99 indicates that about 99% variations in GDPPC are jointly explained by changes in the explanatory variables of the model while the remaining 0.01% may be attributed to the error term. The probability F-statistic value of 0.000000 shows that the overall model is significant in explaining GDPPC in Nigeria.

Discussion of Findings

The consistent positive and significant impact of GFCF on GDPPC in both short run and long run conforms to a priori expectation and corroborates the results of Daura (2009), Odeleye (2012), Ehigiamusoe (2013) and Otieno (2016). It shows that the available physical capital at the disposal of Nigeria is sufficient to attain sustainable GDPPC. The consistent negative impact of LABF on GDPPC in both short-run and long-run undermines a priori expectation and the finding of Appiah (2017) but supports the findings of Daura (2009) and Otieno (2016). This may be attributed to high rate of unemployment, lack of critical infrastructure, poor quality of human capital and lack of motivation arising from poor remuneration of workers in Nigeria. Other plausible reasons for the non-conformity of this result include impeding factors inherent in the educational system such as over-emphasis on paper qualifications as against delivery, redundancy of some skills and workers, etc. The positive and significant impact of GCEE in both periods contradicts the finding of Odeleye (2012) but lends credence to theoretical expectation as the growth of government capital

expenditure on education was expected to improve GDPPC. This is an indication that government efforts at funding educational infrastructural facilities are yielding positive fruits and a motivation for government to commit more funds. Government recurrent expenditure on education produced mixed result. It impacted insignificantly negative in the short-run and insignificantly positive in the long-run. The positive impact corroborates the finding of Odeleye (2012) and also conforms to theory while the negative impact contradicts theory. The insignificance and unconformity to theory may be due to high level of mismanagement and embezzlement of funds in our education sector. The negative impact of PSGER on GDPPC in both periods contradicts a priori expectation and the results of Odeleye (2012) but lends credence to the finding of Appiah (2017). The positive impacts of SSGER and TSGER on GDPPC in both periods conform to theory. The SSGER result supports the results of Odeleye (2012) and Appiah (2017). A critical look at the impact of PSGER, SSGER and TSGER shows that only SSGER impacted significantly on GDPPC. This is a clear indication that the education curriculum is faulty especially at tertiary level as it produces graduates who are only equipped for the Arthur Lewis world (of surplus labour) which is unemployable in the modern sectors of today. This presents the need for urgent revision of the curriculum. A plausible explanation for the negative impact of PSGER on GDPPC is that in Nigeria, education at the primary level is not adequate to provide the needed skills to make one employable and be well remunerated. More-so, given the very high unemployment rate in Nigeria, the few available jobs in the formal sector are rationed among those with higher qualifications, thus crowding-out those with only primary education. The positive impact of adult literacy on GDPPC is in tandem with a priori expectation. However, the impact is only significant in the long-run. The insignificant short-run impact may be attributed to high rate of brain drain in the country where some of the best brains travel out of the country in search of greener pastures abroad. This is compounded by the existence of weak institutional mechanisms which have enthroned favouritism, nepotism, tribalism, and so on., at the expense of meritocracy. The policy implication is that adequate remuneration and conducive working environment should be provided to workers in Nigeria to ameliorate the problem of high incidence of brain drain. Again, favouritism, nepotism, tribalism, and so on., should be dethroned while offer of job appointments should be purely based on merit.

One striking finding about this model is that the NPE consistently impacted insignificantly negative on GDPPC in both short-run and long-run and this raises an alarm for further revision of education policies. In order to determine the plausibility of the above empirical results, the model is subjected to several residual diagnostic tests of model adequacy and the summary of the results is presented in Table 4.7.

Table 4.7

Summary of the results of residual diagnostic tests of model adequacy

Breusch-Godfrey serial correlation LM test			
F-statistic	0.631419	Prob. F	0.4436
Obs*R-squared	1.519999	Prob. Chi-Square	0.2176
Heteroskedasticity test: Breusch-Pagan-Godfrey			
F-statistic	0.506095	Prob. F	0.8934
Obs*R-squared	10.84965	Prob. Chi-Square	0.7632
Jarque-Bera test of normality			
Jarque-Bera	1.354127	Probability	0.508107

Source: Computed by the authors using Eviews 10.0

Tests critical values are compared at 5% level of significance

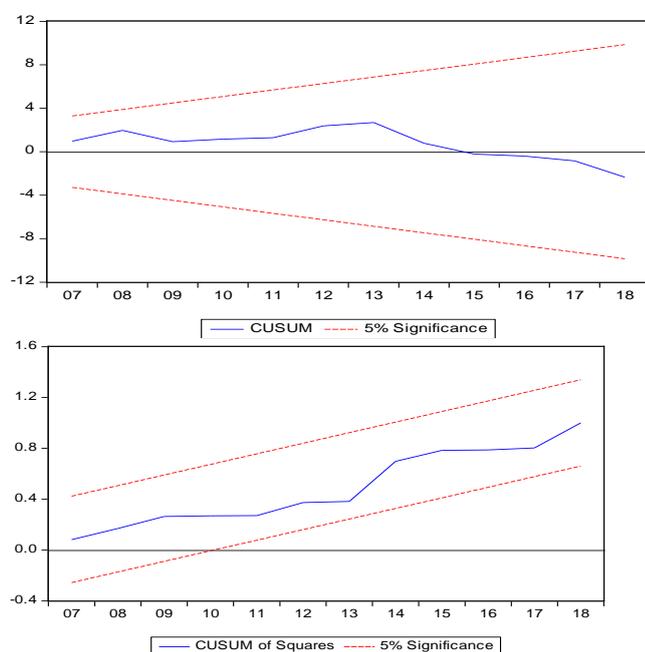


Figure 4.1: Result of CUSUM and CUSUM of Squares Test of Stability

The residual tests passed the diagnostic tests of normality, autocorrelation and heteroskedasticity as the probability values of both F-statistic and observed R-squared are greater than 0.05. The parameter stability of estimated function has been the more crucial test. This stability of the model is confirmed by the outcome of CUSUM and CUSUM of squares tests. It can be seen that the CUSUM and CUSUM of squares lines appear within the acceptable region of the graph. This shows that the coefficients are stable and that the estimates are reliable for policy inference.

Summary, Conclusion and Policy Recommendations

This paper empirically examined the impact of education funding, school enrolment rates and literacy rate on per capita gross domestic product (GDPPC) in Nigeria using autoregressive distributed lag (ARDL) data analysis technique; and annual time series data covering the periods of 29 years (1990 – 2018). The model was specified based on the

modified augmented Solow - Swan neoclassical growth model of Mankiw, Romer and Weil (1992). The ADF, PP and breakpoint unit root tests indicated that the variables are integrated of order 0 and 1 which necessitated the use of ARDL technique. The bounds test to cointegration revealed a long-run relationship among the variables which led to estimation of both short-run and long-run impact of the explanatory variables on GDPPC. The short run and long run results revealed that GFCF, GCEE, SSGER, TSGER and ADLR impacted positively on GDPPC with most of them being significant while LABF and PSGER impacted negatively on GDPPC. GREE impacted insignificantly negative and insignificantly positive on GDPPC in the short-run and long-run respectively.

One striking finding of this study is that the changes in national policy on education and the structural break observed in GDP data set in 2001 consistently impacted negatively on GDPPC in both periods thus necessitating the need for further revision of education policies in Nigeria. The speed of adjustment of GDPPC to disequilibrium in the explanatory variables is 85%. That means that 85 % of the deviations are corrected periodically to ensure convergence at the long run. The coefficient of determination shows that about 99% variations in GDPPC are jointly accounted for by changes in the modelled explanatory variables. The F-statistical probability value of 0.000000 revealed the overall significance of the model, whereas the satisfactory outcome of all residual diagnostic tests of model adequacy indicate acceptance of the model and plausibility of the obtained results for policy formulation.

The study concludes that education remains the major tool for achieving sustainable gross domestic product (GDP) and per capita GDP growth rates in Nigeria though the potentials have not been fully harnessed due to poor education funding, poor school enrolment rates, inefficient curriculum, poor education policies and inadequate teaching, learning and research facilities. This is evident in the negative impact of labour on GDPPC and poor performance of literacy rate and few other education variables in the model. One of the major limitations of the study is data collection and measurement. However, the World Bank Development Indicator data base were utilized very judiciously. As part of agenda for further studies, examination of the relationship between education expenditure, school enrolment and literacy rate on GDP per capita at the regional level will be very useful for education policy formulation in the African region.

In the light of the empirical findings, the study recommends as follows:

1. The government should review and revise further the current education curriculum in Nigeria that only qualifies graduates for Arthur Lewis world of surplus labour which is unemployable in the modern sectors of today and make it more entrepreneurially based so that graduates can be self-employable and contribute meaningfully to growth and sustainable development of Nigeria.

2. Education at all levels should be among the top priorities of all the three-tiers of government in Nigeria. Government should increase its budgetary allocation to education from the current 7.04% to at least the minimum benchmark of 26% recommended by UNESCO for developing countries. The government should also encourage massive and proactive non-governmental organizations (NGO) and private sector participation in the education sector in the form of provision of scholarships, research grants, adequate infrastructure, and establishment of private schools that meet the required standard. To further boost education funding, the Federal Government of Nigeria (FGN) should enact laws extending the social responsibilities of multinational companies operating in Nigeria to a compulsory 4%

contribution of their profits to funding education in Nigeria. Again, the Tertiary Education Trust Fund should be more focused on its mission of funding infrastructural facilities, research, scholarships, education conferences, etc., in our institutions of higher learning and funds should be strictly utilised on approved projects/programmes. To ensure judicious use of funds, the FGN should also design and institutionalise adequate systemic frameworks capable of monitoring and fighting corruption plaguing our institutions of learning to a zero level.

3. Government should also ensure adequate remuneration for education workers like lecturers, teachers, administrators and curriculum developers to motivate workers, reduce brain-drains and attract foreign experts into the sector. It should also dethrone favouritism, nepotism, tribalism, etc., enthrone meritocracy in the offer of job appointments.

This paper extends and contributes to the literature on effects of government education expenditure and school attainment on per capita income in Nigeria and by extension the African region in five ways. First, we show why sustainable government expenditure matters for quality school attainment and per capita income increases. Second, the paper, unlike previous studies, uses the most comprehensive data set on government expenditure, literacy rate, labour force, and other related variables over the reviewing period. Third, using this data set, the paper showed some new interesting stylized facts on the variables of interest. Four, the paper empirically investigated the effects of key government and educational drivers of per capita income with a view to drawing key lessons for Nigeria. Five, we offer policy suggestions in the light of the evidence that would help Nigeria policy makers and by extension the Africans to effectively tackle the problem of poor household income and poor per capita income.

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