Human Capital Development and Economic Growth in Nigeria

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Abstract
This paper examines the impact of human capital development on economic growth in Nigeria. Theoretical growth models and macroeconomic evidence suggest that human capital accumulation is an important determinant of per capita income growth. However, Hideki et al. (2005) note that outliers, measurement errors, and incorrect specifications may have affected early macroeconomic studies that found a weak relationship between growth and human capital accumulation. While recent studies addressing these problems are beginning to show larger positive effects, the potential endogeneity of human capital accumulation has received relatively little attention. We therefore investigate the relationship between human capital and economic growth in Nigeria with time series data which covers periods 1981-2010. Adopting the endogenous modeling approach cast within the autoregressive distributed lag (ARDL) framework, the bounds testing analysis indicated existence of co integration between economic growth and human capital development indicators. Findings also show that human capital development indicators had positive impact on economic growth in Nigeria within the reviewed periods; however, their impacts were largely statistically insignificant. Further evidence indicated that equilibrium is fully restored for any distortion in the short-run. On this basis of the emanating findings, this study proffered the need for government to invest more in human capital development process and endeavours prioritize the health and education sectors budgeting considering their growth driving potentials in Nigeria. Similarly, government should endeavour to pay attention to the issue of school enrolment.
Keywords: Bounds Test, Economic Growth, Endogeneity, Human Capital Development, Nigeria

1.   Introduction

The role of human capital in economic growth cannot be overemphasized. The development of human capital has been recognized by economists to be a key prerequisite for a country's socio-economic and political transformation. Among the generally agreed causal factors responsible for the impressive performance of the economies of most of the developed and the newly industrializing countries is an impressive commitment to human capital formation (Adedeji and Bamidele, 2003; World Bank, 1995; Barro, 1991). This has been largely achieved through increased knowledge, skills and capabilities acquired through education and training by all the people of these countries. Human capital plays a key role in versions of both neoclassical and endogenous growth models (Mankiw, Romer and Weil, 1992; Rebelo, 1991; Sianesi and van Reenen, 2003). The critical difference is that in the first group, economic growth is still ultimately driven by exogenous technical progress, whereas in the second, no additional explanation is needed and human capital is much more important. Endogenous growth models predict that a permanent change in some policy variable can cause a permanent change in an economy's growth rate. Unlike time series evidence for the US, at first sight the data for many developing economies are broadly consistent with this prediction (Jones, 1995), showing accelerated growth after 1945. The exogenous technical progress of the neoclassical model can change in response to policy as well. According to Parente and Prescott (1999, 2000), the choices of each country's citizens determine how fast they raise productivity, by diverting their time from normal work to productivity-enhancing activities. In doing so, they can draw on the world stock of knowledge and borrow capital on world markets. Policy-induced constraints, such as taxation, or entry barriers at the plant level, create international differences in aggregate productivity, even when the stock of useful knowledge is common to all countries.

It has been stressed that the differences in the level of socio-economic development across nations is attributed not so much to natural resources and endowments and the stock of physical capital but to the quality and quantity of human resources. According to Oladeji and Adebayo (1996), human resources are a critical variable in the growth process and worthy of development. They are not only means but more importantly, the ends that must be served to achieve economic progress. This is underscored by Harbinson (1973) who opined that "human resources constitute the ultimate basis for the wealth of nations. Capital and natural resources are passive factors of production; human beings are the active agents who accumulate capital, exploit natural resources, build social, economic, and political organizations, and carry forward national development. Clearly, a country which is unable to develop the skills and knowledge of its people and to utilize them effectively in the national economy will be unable to develop anything else". Investment in human capital plays an important role in increasing competitiveness, improving quality of life of the population and in generating economic growth and development of a country. Currently, Nigeria wishes to be among twenty most developed countries in the world by year 2020. To give effect to this, one of the pre-requisites is to ensure that capable manpower is available in various areas of social, political, institutional, technological and economic endeavours which drive

the process of growth, development and industrialization. Consistent with the NEEDS programme of 2004, and the current Vision 20: 2020 development programme agenda, the country's human resource development needs to be strengthened and stabilized in order to accelerate economic activities and trigger off higher productivity, income and economic growth and development. The nation's aspiration to be in the league of 20 leading economies in the world by Year 2020 emerged on the realization that the endowment of Nigeria in material and human resources places her in good position to achieve this greatness. But the Human Development Report of UNDP (2008) shows that Nigeria is still at the low level of human development compared to countries in emerging economies. This is worrisome and poses a threat to 20: 2020 agenda. Education, as a measure for quantity, availability and human resource quality is the sole method which can be used to analyze the impact of human resource on economic growth (Benhabib and Spiegel, 1994). To many people, capital is in the form of bank account, financial and other income-generating physical assets.

Jhingan (2005) points out that in the process of economic growth, it is customary to attach more importance to the accumulation of physical capital than human capital. These physical resources are forms of capital. But aside these tangible capital resources are human capital resources as an aggregate of education or schooling, training and health care delivery. These aggregation of human resource development can further increase productivity, income, improve health and fitness, good habits in individuals such as being trustworthy and responsible. Therefore, education and training are the most important factors in human resource development. Economists often use the term human capital for education, health and other human capabilities that can enhance productivity (Todaro and Smith, 2003). Thus, quality of human resources connotes the state of education, health and other human capabilities that can raise productivity when increased. Studies in the United States of America have shown that high school and college education lead to improvement in earnings even after taking into consideration the direct costs (study fees, cost of purchasing books and other materials) and indirect costs (foregone income from being employed) during schooling. Studies in several other countries with different cultural and economic systems also showed the same outcome that income obtained by educated people will always be above the average income level.

Furthermore, growth continuum per capita income of a country is partly dependent on scientific and technical knowledge development, which further improves productivity of labour and other inputs in production. In fact, economic growth is also closely connected with new knowledge drive and also quality of human resource. This is obvious from the fact that there have been tremendous achievements in education accompanied with major development in technological knowledge in all countries which have achieved significant economic growth. Leading economic record for countries like Japan, Taiwan and a few more Asian countries for example, show the importance of human resource development in playing its role in leading economic growth. Lawanson (2009) points out that health and education are two closely related human (resource) capital components that work together to make the individual more productive. Hence, taking one component as more important than the other is unrealistic as a more educated individual who is ill is as inefficient as an illiterate but healthy individual. Therefore, both components are equally important because of their close relationship. The aim of this study is to examine both the long-run and short-run impact of human capital development on economic growth in Nigeria.

2.   Review of Related Literature

Early studies of the effects of human capital on growth, such as Mankiw, Romer and Weil (1992) and Barro (1991), were based on data sets pertaining to a very diverse array of (more than 100) countries during the post-1960 era. They used narrow flow measures of human capital such as the school enrolment rates at the primary and secondary levels, which were found to be positively associated with output growth rates. Barro and Sala-i-Martin (1995), among many others, have also included life expectancy and infant mortality in the growth regressions as a proxy of tangible human capital, complementing the intangible human capital measures derived from school inputs or cognitive tests considered; their finding is that life expectancy has a strong, positive relation with growth.

Acemoglu (1998) has offered a formal demonstration of how positive spill-over effects (pecuniary externalities) created by workers' educational and training investment decisions can give rise to macro-level increasing returns in human capital. His model supposes that workers and firms make their investments in human and physical capital respectively, before being randomly matched with one another. The direct consequence of random matching is that the expected rate of return on human capital is increasing in the expected amount of (complementary) physical capital with which a worker will be provided. According to Leeuwen (2007), human capital is formal and informal education, yet it can also contain factors such as the costs of raising children, health costs and ability. He observes further that the health and education components are recognized although, education comes ahead of health, showing the priority placed on it. Similarly, Igun (2006) defines human capital as the total stock of knowledge, skills, competencies, innovative abilities possessed by the population. These obviously have education as their bedrock.

Neoclassical growth implies conditional convergence; growth of income depends upon initial income

plus determinants of eventual steady state income. The most critical determinant is technology improvement, which is expensive and can be influenced by policy (Parente and Prescott, 1999). By contrast there is no steady state with endogenous growth, and therefore no conditional convergence, because there is no diminishing returns in the aggregate production function. Poor countries will continue to be relatively poor, and big economies will grow faster than small. One reason for endogenous growth (see Rebelo, 1991) is that human capital is embodied in labour; one worker's human capital cannot benefit another's in the same way as from their own improved human capital.

No doubt, there can be no significant economic growth in any country without adequate human capital development. In the past, much of the planning in Nigeria was centred on the accumulation of physical capital for rapid growth and development, without recognition of the important role played by human capital in the development process. People are assets – in fact a country's most valuable assets. It is essential for human development that these assets be deployed sensibly. Nigeria's overarching objective since independence in 1960 has been to achieve stability, material prosperity, peace and social progress. However, this has been hampered as a result of internal problems. These include inadequate human development, primitive agricultural practices, weak infrastructure and uninspiring growth of the manufacturing sector, a poor policy and regulatory environment and mis-management and misuse of resources. In order to ensure the economy delivers on its potentials, the country experimented with two development philosophies; a private sector-led growth in which the private sector served as the "engine house" of the economy and a public sector – driven growth in which the government assumed the "commanding heights" of the economy. The initial low level of private sector development however, led to public sector dominance of the economy, encouraged by growth in the oil sector (UNDP, 2009).

2.1 Stylized Facts of Human Capital Growth in Nigeria

The role of human resource in encouraging economic progress has been acknowledged in many studies. Human resource has been indentified not only as a major growth determinant and a channel to ease poverty but it is also very important in building or improving the quality of human beings in general (Kasim, 2010). The growth focus in Millennium Development Goals (MDGs) is more concentrated at the importance in achieving clear and real progress as an indicator or human capital indicator measured through educational foundation. Most studies have examined the effect of education through human capital investment on economic growth. The inter-relationship between human resource and economic growth has extensively been discussed in the literature. Ramirez and Stewart (1998) explain that although there are bilateral ties between human capital resource and economic growth, specific factors to link them still lacks in the aspect of systematic exploration. They show that high level human resource capital development will affect the level of the economy through population's increase in their capacity, productivity and creativity. The population's education will determine their ability to absorb and organize all economic growth resources such as technology usage or technological innovation. Studies conducted in Indonesia examined the inter-relationship between human capital development and economic growth from the economic crisis experienced in the country. Akita and Alisjahbana (2002) explain that areas having quality of human resource are able to cope better when facing an economic crisis. In his study, Wibisono (2001) included variables such as educational attainment which is measured as successful completion of educational level, life expectancy, fertility rate, infant mortality and rate of inflation. Result of his analysis shows that positive influential variables towards economic growth are education, life span and infant mortality. The study shows that human capital, in the form of education especially, is the most important contributor to economic growth. According to Wibisono (2001) the Indonesia Human Development Report also confirms that there indeed exists a bilateral tie between human capital development and economic growth. A recent study by Mansur *et al.* (2009) found that education provides better employment opportunities and thus, increases the level of income of an individual. Therefore, education is perceived to be an important factor in human capital formation. The study also found that a correlation exists between education investment among women and fertility. In Africa, educated women are able to get higher wages, and tend to have educated children. Conclusively, the research by the DHS as cited in Hobcroft (1993) shows that the inter-relationship between education and fertility differ according to education levels whereby there is a negative relationship for women who complete secondary school education and fertility.

It is noteworthy that since the advent of civilian rule in 1999, growth performance has improved significantly. The last seven years witnessed an average growth rate of about 6 percent (UNDP, 2009). However, economic growth has not resulted in appreciable decline in unemployment and poverty prevalence. Human development has remained unimpressive as shown by the indicators in the 2.1.1 Table below. Over the years, successive Nigerian Governments recognized the importance of human capital formation in the development process and have embarked on various programmes and projects which led to the establishment of educational institutions and health centres throughout the country. However, in the late 1970s and early 1980s, Federal Government spending grew substantially resulting in fiscal crisis, inflation, and heavy borrowings. Subsequently,

through the austerity measures adopted in 1982 and Structural Adjustment Programme (SAP) introduced in 1986, the country attempted to bring down fiscal deficits as part of its stabilization and adjustment programmes, often by reducing public spending on across-the board basis. These reductions resulted in unprecedented economic and social costs as human resources development was neglected with adverse long-term development consequences (Oyinlola and Adam, 2003). Thus, the ultimate goal of economic development which underscored the need to improve the well-being of people was overlooked.

Table 2.1.1: Nigeria's Human Development Summary Statistics by Zones, 2008

Zones	Human Development **Index (HDI Value)**	Human **Poverty Index (HPI)**	**Gender** Development **Measure (GDM)**	**Gender Empowerment Measure (GEM)**	**Inequality Measure (INQ)**
North Central	0.490	34.65	0.478	0.244	0.49
North West	0.420	44.15	0.376	0.117	0.44
North East	0.322	48.90	0.250	0.118	0.42
South West	0.523	21.50	0.507	0.285	0.48
South East	0.471	26.07	0.455	0.315	0.38
South South	0.573	26.61	0.575	0.251	0.41

Source: UNDP (2009) Summary of Human Development Report for Nigeria: 2008-2009.

In more recent times, renewed attention was paid to the role of human capital formation in the country's development process and this has prompted the federal government to declare in its 1999-2003 economic policy programme that the economy exists for and belongs to the people, and at all times the general well-being of all the people shall be the overriding objectives of the government and the proper measure of performance. This policy statement of the government is further reiterated in the National Economic Empowerment and Development Strategy (NEEDS). The provision of high-quality education and health care to all the country's citizens is considered a key element of public policy by all levels of government. Against the above background, the aim of this study is to examine the impact of human capital formation on economic growth in Nigeria between 1981 and 2010 and on the basis of the findings, recommend policies and measures for improving human capital formation in the country.

3.1 Theoretical Framework and Methodology

The theoretical framework of this study is based on the endogenous growth model where persistent economic growth is conditioned on human capital accumulation (see Lucas, 1988; Romer, 1990; and Romer, 1994). The proponents of endogenous growth models opined that growth rate of output is endogenously determined within the economic environment. The implication of these models is that human capital is the driving force in the growth process of an economy. The theoretical consideration which this study is anchored on stems from the generalization of the human capital production technology as determinants of growth and the accessible channels of human capital investment in developing countries in which associated consensus is still controversial in literature.

Park (2004) argued that investments in human capital are determined by individual optimization decisions based on the market incentives and government subsidies. Although endogenous growth models indicate that a society with higher incentives for human capital investments would generate higher growth, it is not clear how the social incentives for human capital should be structured across different education levels. This is an important issue since different structures will lead to different compositions of human capital in the population which may or may not have differential impact on the productivity growth. I this paper, we argued that private investors have economic incentives in terms of profit and asset growth for human capital investment in developing countries, while the government has social or welfare incentives on investment and consumption on human capital development. Our proposed arguments indicates that both private and public sectors participate in human capital development process necessary for driving economic growth over time. This has been earlier argued by Ram (1986), Josephat *et al.* (2000), Niloy *et al.* (2003), and Adesoye *et al.* (2010) with little attention and methodological approach.

From the above, we consider an economy where final output is dependent two distinct factors of production, physical capital and labour. For a Cobb-Douglass production function with constant return to scale technology:

$$Y_t = A_t K_t^{\beta} L_t^{1-\beta}, \qquad (0 < \beta < 1) \qquad (3.1.1)$$

Where Y_t, K_t, and L_t denote gross domestic product, physical capital stock, and total labour force at time t. Time-variant technological level (A_t) is influenced by factors contributing to the enhancement of efficiency and knowledge environment.

Following Park (2004), endogenous growth models of Lucas (1988), Romer (1990), and Jones (1995) provide

theoretical frameworks where human capital enhances productivity growth. Other studies including works of Bartel and Lichtenberg (1987), Foster and Rosenzweig (1996), and Berman *et al.* (1998) have suggested that human capital enhances the adoption of technology or that human capital is complementary to technology use. Benhabib and Spiegel (1994), and Bils and Klenow (2000) introduce models where average human capital in the population influences the productivity growth. Following these empirical works, this study considers human capital per labour influencing the rate of technological progress. Consideration of human capital effect in relation to productivity growth is shown as:

$$\dot{A}_t / A_t = \tau + \frac{\varphi H_t}{L_t} \tag{3.1.2}$$

Where $\dot{A}_t = dA_t/dt$, τ is constant growth rate of technological progress, H_t represents the aggregate of the capital present in the economy, L_t is labour force (or economy's labour supply) and φ denotes the human capital effect on the productivity of growth.

Given that h_{it} is the human capital of an individual i at time t, aggregate human (H_t) is defined as the sum of the human capital of individuals presents in the economy.

$$H_t = \sum_{i=1}^{n} h_{it} \tag{3.1.3}$$

Where n is the population size of the country. Hence, incorporating equation $(3.1.3)$ into the $(3.1.1)$ and taking natural logarithm and introducing the stochastic term, yields the expression:

$$LogY_t = LogA_t + \beta LogK_t + (1-\beta)L_t + \gamma H_t + \mu_t \tag{3.1.4}$$

3.2 Model Specification and Estimation Procedure

The expression (3.1.4) is the theoretical model that defines the effect of human capital on economic growth. In this study, we modified equation (3.1.4) as follows:

$$GDP_t = f(GCF_t, GEE_t, GEH_t, LBF_t, PSE_t, SSE_t, TER) \tag{3.2.1}$$

Therefore, equation (3.2.1) forms the theoretical specified model for this study. Here, GDP is gross domestic product, GCF is Gross capital formation, GEE is government total expenditure on education, GEH is government total expenditure on health, LBF is labour force, PSE is primary school enrolment, SSE is school enrolment, TER is tertiary enrolment, and t is time. The variables in the right hand side of equation 3.2.1 represent the human capital development indicators.

In line with the objective of this study, the long-run and short-run impact of human capital development on economic growth is examined using the autoregressive distributed lag (ARDL) framework. In the last two decades, a number of techniques such as the Engle and Granger (1987) and the full information maximum likelihood method of Johansen co-integration (Johansen, 1988; Johansen and Juselius, 1990) have been employed to test the existence of long run relationship among variables. Recently, a relatively new technique – the autoregressive distributed lag model (ARDL)– has become more relevant. The ARDL approach to co-integration test, also known as the bounds testing approach, was developed by Pesaran and Shin (1999) and latter extended by Pesaran *et al.*, (2001). The statistic underlying the procedure is the Wald or *F*-statistic in a generalized Dickey-Fuller type regression, which is used to test the significance of the variables under consideration in a conditional unrestricted equilibrium correction model (UECM). The ARDL approach has several advantages over other traditional techniques.

Basically, bounds test approach involves two steps. The first step is to investigate the existence of long-run relationship among the included variables. The ARDL framework for this study is formulated as follows:

$$\Delta GDP_t = \delta_0 + \pi_1 GDP_{t-1} + \pi_2 GCF_{t-1} + \pi_3 GEE_{t-1} + \pi_4 GEH_{t-1} + \pi_5 LBS_{t-1} + + \pi_6 PSE_{t-1} + \pi_7 SSE_{t-1}$$

$$+ \pi_8 TER_{t-1} + \sum_{i=1}^{a} \sigma_i \Delta GDP_{t-i} + \sum_{i=0}^{b} \alpha_i \Delta GCF_{t-i} + \sum_{i=0}^{c} \emptyset_i \Delta GEE_{t-i} + \sum_{i=0}^{d} \gamma_i \Delta GEH_{t-i}$$

$$+ \sum_{i=0}^{e} \partial_i \Delta LBS_{t-i} + \sum_{i=0}^{f} \vartheta_i \Delta PSE_{t-i} + \sum_{i=0}^{g} \omega_i \Delta SSE_{t-i} + \sum_{i=0}^{h} \varphi_i \Delta TER_{t-i}$$

$$+ \varepsilon_t \tag{3.2.2}$$

Where δ_0 is the drift component, Δ is first-difference operator and a, b, c, d, e, f, g and h are the optimal lag lengths for each incorporated series. Note that there is no reason that the lag-length terms are equivalent to each other. The second part of the equation with $\sigma_i, \alpha_i, \emptyset_i, \gamma_i, \partial_i, \vartheta_i, \omega_i$ and φ_i represents the short-run dynamic multipliers of the model whereas the parameters π_i represent the long-run multipliers. Note that the terms with summation sings are used to model the short-run dynamic structure. Appropriate lag length is selected based on

the Akaike Information Criterion (AIC) before the selected model is estimated using the ordinary least squares (OLS) method. For annual data, Pesaran and Shin (1999) recommended choosing a maximum of 2 lags from which the lag length that minimizes the criteria is selected.

The second stage involves the estimation of the following conditional ARDL (a, b, c, d, e, f, g, h) long-run model:

$$GDP_t = \delta_0 + + \sum_{i=1}^{a} \sigma_i\, GDP_{t-i} + \sum_{i=0}^{b} \alpha_i\, GCF_{t-i} + \sum_{i=0}^{c} \emptyset_i\, \text{GEE}_{t-i} + \sum_{i=0}^{d} \gamma_i\, \text{GEH}_{t-i}$$
$$+ \sum_{i=0}^{e} \partial_i\, LBS_{t-i} + \sum_{i=0}^{f} \vartheta_i\, PSE_{t-i} + \sum_{i=0}^{g} \omega_i\, \text{SSE}_{t-i} + \sum_{i=0}^{h} \varphi_i\, \text{TER}_{t-i}$$
$$+ \varepsilon_t \qquad (3.2.3)$$

Where all variables are as previously defined. Estimation of equations (3.2.3) involves the selection of the optimal lag orders of the ARDL (a, b, c, d, e). Finally, short-run dynamic parameters of the model associated with the long-run estimates can be obtained by estimating the following error correction model given as:

$$\Delta GDP_t = \delta_0 + + \sum_{i=1}^{a} \sigma_i\, \Delta GDP_{t-i} + \sum_{i=0}^{b} \alpha_i\, \Delta GCF_{t-i} + \sum_{i=0}^{c} \emptyset_i\, \Delta \text{GEE}_{t-i} + \sum_{i=0}^{d} \gamma_i\, \Delta \text{GEH}_{t-i}$$
$$+ \sum_{i=0}^{e} \partial_i\, \Delta LBS_{t-i} + \sum_{i=0}^{f} \vartheta_i\, \Delta PSE_{t-i} + \sum_{i=0}^{g} \omega_i\, \Delta \text{SSE}_{t-i} + \sum_{i=0}^{h} \varphi_i\, \Delta \text{TER}_{t-i}$$
$$+ \eta ECM_{t-1} + \varepsilon_t \qquad (3.2.4)$$

Where ECM is the error correction term (representing the residual of the co-integrating equation) and η represents its coefficient which measures the speed of adjustment. The error correction coefficient shows how quickly the variables converge to equilibrium (i.e., speed of adjustment back to long-run equilibrium after a short-run disturbance) and should be statistically significant and negatively signed.

3.3 Data Requirements and Sources
The time series data required for this study are gross domestic product, gross capital formation, human capital development index, expenditure on health, and labour supply (proxied by labour force). These data were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin, and the National Bureau of Statistics (NBS).

4.1 Empirical Result Summary of Descriptive Statistics of the Variables
The summary of descriptive statistics of GDP, GCF, GEE, GEH, LBF, PSE, SSE and TER are reported in table 4.1.1 the descriptive statistics give the characteristics of the variables. As observed from the table, the mean, median, standard deviation, skewness as well as the kurtosis and Jarque-Bera measures of our variables of interest are given. The GDP, GCF, GEE and GEH for example have mean values of 41781.27, 596436.4, 53607.12 and 35119.12 respectively LBF, PSE, SSE and TER have mean values of 42499238, 17015.20, 4183203 and 369160.3 respectively. The standard deviations of GDP, GCF, GEE and GEH are 62122.35, 982221.7, 71608.65 and 53009.81 respectively while the statistics are 11394345, 3657.784, 1330223 and 262324.0 for LBF, PSE, SSE and TER respectively.

Table 4.1.1: Summary of Descriptive Statistics

	GDP	GCF	GEE	GEH	LBF	PSE	SSE	TER
Mean	41781.27	596436.4	53607.12	35119.12	42499238	17015.20	4183203	369160.3
Median	1229.900	173352.5	13882.88	4864.555	40873000	16030.50	4017999	265310.5
Maximum	185760.0	4009729	258700.0	195400.0	65170629	25705.00	6625943	1096059
Minimum	581.3000	7989.760	343.8000	110.8100	4128000	11540.00	2503952	87066.00
Std. Dev.	62122.35	982221.7	71608.65	53009.81	11394345	3657.784	1330223	262324.0
Skewness	1.185435	2.150896	1.372973	1.575928	-0.574416	0.484512	0.616497	0.988227
Kurtosis	2.878919	6.977330	3.968930	4.477210	6.126820	2.294186	2.152467	3.080694
Jarque-Bera	7.044602	42.90570	10.59881	15.14544	13.87103	1.796476	2.798235	4.891105
Probability	0.029531	0.000000	0.004995	0.000514	0.000973	0.407287	0.246815	0.086678
Sum	1253438	17893093	1608214	1053574	1.27E+09	510456.0	1.25E+08	11074808
Sum Sq. Dev.	1.12E+11	2.80E+13	1.49E+11	8.15E+10	3.77E+15	3.88E+08	5.13E+13	2.00E+12
Observations	30	30	30	30	30	30	30	30

Source: Authors Computation (2014) using E-Views 7

Furthermore, the Jarque-Bera[1] statistics show that PSE, SSE and TER are normally distributed while GDP, GCF, GEE, GEH and LBF are not normally distributed.

4.2   Unit Root Test Results

The results of the DF-GLS unit root test are displayed in Table 4.2.1. The DF-GLS test statistics indicate that all the series were non-stationary at level but become stationary at first difference. This implies that the null hypothesis of non-stationarity for all the variables is rejected at first difference of each series. Most importantly, the results show that we can confidently apply the ARDL methodology to our model.

Table 4.2.1: Summary of DF-GLS Unit Root Test Results

Variables	DF-GLS Statistics		Conclusion
	Level	**First Difference**	
GDP_t	2.199037	-1.742624***	*I*(1)
GCF_t	1.689638	-1.961778**(***)	*I*(1)
GEE_t	2.424084	-2.558877**(***)	*I*(1)
GEH_t	-0.127809	-5.659167*(**)***	*I*(1)
LBF_t	-2.177673	-8.397562*(**)***	*I*(1)
PSE_t	-1.148339	-7.019421*(**)***	*I*(1)
SSE_t	-1.450823	-6.313047*(**)***	*I*(1)
TER_t	-1.229154	-6.660005*(**)***	*I*(1)

Note: Superscripts *, ** and *** denote rejection of the null hypothesis of existence of unit root at 1%, 5% and 10%

significance levels respectively. Model includes intercept only with lag selected based on Akaike Information

Criteria (SIC).

Source: Authors Computation (2014) using E-Views 7

The ARDL bounds test for the presence of long-run relationships in equation 3.2.2 are reported in Table 4.2.2. The bounds *F*-test for cointegration test yields evidence of a long-run relationship between economic growth and human capital development indicators. The computed *F* statistic, $F_C(.) = 8.74,$ is greater than the upper bound of the 1% critical values resulting in the rejection of the null hypothesis of long-run relationship between the examined variables. This evidence rules out the possibility of estimated relationship being spurious.

Table 4.2.2: Bounds Test Results for Cointegration Relationship

Critical Bounds Value of the *F*-statistic

K	1% level		5% level		10% level	
	I(0)	*I*(1)	*I*(0)	*I*(1)	*I*(0)	*I*(1)
7[PS]	2.96	4.26	2.32	3.50	2.03	3.13
7[N]	3.49	5.15	2.56	3.90	2.21	3.42

Calculated *F*-statistics

$$F_C(GDP/GCF, GEE, GEH, LBF, PSE, SSE, TER) = 8.74023***$$

Note: The lag structure was selected based on the Schwartz Information Criterion. K is the number of regressors. [PS] Pesaran et al. (2001:300), Table CI (iii), Case III: Unrestricted intercept and no trend, [N]Narayan (2004), Appendix: Case III for N=50. ***, **, * denotes statistical significance at 1%, 5%, and 10% levels respectively. Table 4.2.3 displays the estimated long-run relationship economic growth and human capital development

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[1] The Jarque-Bera (JB) test is used to check hypothesis about the fact that a given sample x_S is a sample of normal random variable with unknown mean and dispersion. JB test has the null hypothesis of normal residuals; hence, its rejection requires low probability, that is, the probability value exceeds 0.05 (or 5%).

indicators. The long-run estimated model revealed that government expenditure on education and health, labour force, primary and tertiary enrolments had positive but insignificant effect on economic growth. The impact of government gross capital formation and secondary enrolment on economic growth was found to be statistically insignificant and negative. It is only tertiary enrolment at lag one that has significant impact on economic growth in the long-run.

The diagnostic test result indicated that the residual generated from the long-run estimates used as error correction term in the short-run model estimates presented in Table 4.2.4 is normally distributed, not serially correlated, and the variance of the error term are homoskedasticity. This indicates that the estimated long-run model is structurally stable and provides reliable estimates for policy simulation.

Table 4.2.3: Estimated Long-run ARDL Model

Variable	Coefficient	Standard Error	t-Statistic	Probability
	Dependent Variable: GDP_t			
C	155.7202	17720.27	0.008788	0.9931
GDP_{t-1}	0.681849	0.170600	3.996767	0.0009
GCF_{t-1}	-0.010550	0.009289	-1.135764	0.2718
GEE_{t-1}	0.020460	0.203640	0.100469	0.9211
GEE_{t-2}	0.312445	0.174117	1.794451	0.0905
GEH_{t-1}	0.021044	0.224776	0.093623	0.9265
LBF_{t-1}	0.000128	0.000235	0.544023	0.5935
PSE_{t-1}	0.656048	1.641715	0.399612	0.6944
SSE_{t-1}	-0.008474	0.006329	-1.338926	0.1982
TER_{t-1}	0.066389	0.019942	3.329089	0.0040
TER_{t-2}	0.010329	0.044987	0.229606	0.8211
R-Squared	0.99	**D.W Statistic**		2.08
Adjusted R^2	0.98	**F-Statistic**		173.7470
Wald F-Statistic	8.74023	**Prob(F-statistic)**		0.0000
		Residual Normality Test		
Jarque-Bera	1.5967		Prob(J.B)	0.4501
		Breusch-Godfrey Serial Correlation LM Test		
F-Statistic	1.851691		Prob. F(2, 15)	0.1742
Obs*R-Squared	5.544169		Prob. Chi-Square(2)	0.0625
		Heteroskedasticity Test: Breusch-Pagan-Godfrey		
F-statistic	3.781786		Prob. F(10,17)	0.0078
Obs*R-squared	19.31670		Prob. Chi-Square(10)	0.0364

Source: Authors Computation (2014) using E-Views 7

Similarly, the short-run estimates of human capital development on economic growth in Nigeria between 1981 to 2010 are presented in Table 4.2.4. The short-run estimates were iterated at different lag lengths and the optimal lag of one was determined using the Akiake and Schwarz information criteria. The error correction term co-efficient that explains the speed of adjustment from any distortion in the short-run to its long-run equilibrium stood at -0.1245. This implies that 12.45% of any disequilibrium is restored in the first year.

Table 4.2.4: Estimated Short-Run ARDL Model

Variable	Coefficient	Standard Error	t-Statistic	Probability
	Dependent Variable: ΔGDP_t			
C	3056.269	2364.520	1.292554	0.5623
ΔGDP_{t-1}	0.194677	0.289098	0.673395	NA
ΔGCF_{t-1}	0.006941	0.011979	0.579423	0.5695
ΔGEE_{t-1}	-0.073844	0.217979	-0.338768	0.7387
ΔGEH_{t-1}	0.324775	0.211541	1.535278	0.1421
ΔLBF_{t-1}	6.54E-05	0.000195	0.335473	0.7411
ΔPSE_{t-1}	1.253071	1.893515	0.661770	0.5165
ΔSSE_{t-1}	-0.010893	0.006711	-1.623134	0.1219
ΔTER_{t-1}	0.050654	0.018411	2.751321	0.0131
ECM_{t-1}	-0.124947	0.056782	-2.200467	0.0402
S.E. of Regression	7856.078	**Durbin-Watson Statistic**		1.849332
Akaike Criterion	21.50620	**Hannan-Quinn Criterion**		21.65166
Schwarz Criterion	21.98199			

Source: Authors Computation (2014) using E-Views 7

5.   Conclusion and Recommendations

In this paper, the impact of human capital development on economic growth in Nigeria has been established and critically analyzed. The adopted theoretical framework emanates from the endogenous growth model that opined that human capital based technological production is a significant driver of economic growth. Considering our small size (1981-2010), the autoregressive distributed lag (ARDL) framework was adopted. This method was used to dynamically examine the impact of human capital development indicators on economic growth in Nigeria.

The bounds testing analysis indicated existence of cointegration between considered set of variables in the ARDL model, while the long-run model indicated that majority of the human capital development indicators had positive impact on economic growth in Nigeria within the reviewed periods, however, their impacts were largely statistically insignificant. Further evidence indicated that equilibrium is fully restored for any distortion in the short-run. On this basis of the emanating findings, this study proffered the need for government to invest more in human capital development process and endeavours prioritize the health and education sectors budgeting considering their growth driving potentials in Nigeria. Similarly, government should endeavour to pay attention to the issue of school enrolment.

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