

The Impact of Human Capital Formation on Economic Growth in Nigeria

Ogujiuba Kanayo

*National Institute for Legislative Studies, National Assembly, Nigeria and Statistics and
Population Studies, Department, University of Western Cape, Cape Town, South Africa
E-mail: kannyog@gmail.com*

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ABSTRACT The importance of human capital formation concept on economic growth cannot be over emphasized and have been the fulcrum of aid and assistance by international agencies and developed countries. Furthermore, evidence from developed countries suggests that human capital has been the major driver of their development process. This notwithstanding, the impact on economic growth in Nigeria has been a subject of debate. Using the Error Correction Model as an analytical tool, this paper examines empirically the relationship between economic growth and human capital development. The study made use of secondary data and examined the time series characteristics of the variables selected, to avoid the problems of spurious correlation often associated with non-stationary time series to concurrently generate long-run equilibrium relationships. In order to achieve linearity, logarithmic calculations were used to examine the variables. Generally, the estimation of the model showed that the variables included in the model provided basic information on the nature of impact on economic growth. Findings also showed that investment in human capital in the form of education and capacity building at the primary and secondary levels impact significantly on economic growth, while capital expenditure on education was insignificant to the growth process. The paper recommends that educational institutions in Nigeria should be re-structured for quality schooling at the primary, secondary and tertiary levels. In a competitive and globalized economy, this will require strategic planning, increase in capacity utilization by the education sector and rebasing of growth fundamentals.

1. INTRODUCTION

The past two centuries were characterized by widespread and intense changes in human living conditions. The process of human capital accumulation accelerated as more and more people acquired the ability to innovate, and to use innovations. On the other hand, the spread of new technologies in turn made it more profitable to acquire knowledge. Also, the biological environment sharply changed. Lifetime duration, which had been virtually the same for thousands of years, increased sharply within just a few generations. Mortality significantly reduced and fertility behaviour changed profoundly, hygienic conditions improved as sanitation became more important and widespread. Economists have always had a great interest in understanding the reasons and the mechanics of these dramatic changes, in particular against the background of the fact that large parts of the world are still underdeveloped. The driving forces, which explain the economic transition towards higher growth paths, are technical progress and most importantly, the process of physical and human capital accumulation. Human capital is an important fac-

tor used in converting all resources to benefit mankind.

Human Capital Development is strategic to the socio-economic development of a nation and includes education, health, labour and employment and women affairs. Investing in human capital development is therefore critical as it is targeted at ensuring that the nation's human resource endowment is knowledgeable, skilled, productive and healthy to enable the optimal exploitation and utilization of other resources to engender growth and development. Nonetheless, no country has achieved sustained economic development without substantial investment in human capital. A number of studies including Barro and Sala-i-Martin (1995), and Temple (1999) have analyzed the channels through which human capital can affect growth. A large amount of this literature has emphasized the complementary relationship between human and physical capital, noting how economic growth can be affected by imbalances in these two stocks, as well as human capital externalities. Among the highly educated groups, scientists and technicians appear to have the most comparative advantage in understanding and adapting new or existing ideas into production processes.

It is observed by economists that economic growth is boosted by human capital utilization and development in any nation. The major source of per capital output in any country; whether developing or developed, with a market economy or centrally planned is an increase in productivity. Per capita output growth is however an important component of economic welfare (Abramowitz 1981). By possessing the ability to produce and use equipment and technology, human beings have become the most important and promising sources of economic growth and productivity. As such, any successful productive program is dependent on human innovative ideas and creativity. According to Romer (1986) and Lucas (1988), in recent times, human capital development and its impact on economic growth emphasized the growth theory. In their work, these authors posit that in the long run, it is possible for output per unit of input to increase even when inputs are exhaustively accounted for.

Human capital development is described as an end or objective of achieving development. It is a way to fulfill peoples' potentials by enlarging their capabilities, and this necessarily implies empowering them and enabling them to participate actively in their own development. Human capital development is also a means for enhancing the skills, knowledge, productivity and inventiveness of people through a process of human capital formation broadly conceived. Thus, human capital development is not a goods or production centered strategy of development. Rather, it is a people centered strategy because what really matters is empowering people to identify their own priorities and to implement programmes and projects of direct benefit to them. This in turn implies the active participation of people in the development process and the consequent need to construct institutions that permit and indeed encourage that participation (Alehile 2009).

People are assets – in fact they are considered as the most valuable assets in a country. As such, it is necessary for human development that these assets are deployed sensibly. An incentive system which is defective can result in a waste of human resources and a higher incidence of poverty as well as greater inequality in the distribution of income. While it is necessary to use existing resources wisely, it is equally important to add to the existing resources through human capital formation. There can be no significant

economic growth in any country without adequate human capital development. In the past, Nigeria has focused on planning and accumulation of physical capital for rapid growth and development, without recognizing the important role played by human capital in the development process. The current Transformation Agenda of the Nigerian Government recognizes the centrality of human capital development as a vital transformational tool and acknowledged its importance in achieving economic growth. Thus, the aim of the agenda is to empower the citizenry to acquire skills and knowledge that would prepare them for meaningful work. The Transformation Agenda, which covers the period 2011-2015 is based and draws its inspiration from the NV 20: 2020 and the 1st National Implementation Plan (NIP). This aims to deepen the effects and provide a sense of direction for the current administration over the next four years. As the global economy, shifts towards more knowledge-based sectors such as the manufacture of (ICT devices, pharmaceuticals, telecommunications and other ICT based services, Research and Development), skills and human capital development become central issues for policy makers and practitioners engaged in economic development both at the national and regional level (Johnson 2011). Since the introduction of human capital theory in the 1960s, attempts have been made address this and related issues.

Today, the global economy is divided into two parts comprising of a few rich nations regarded as the developed countries (DCs) and many poor nations regarded as the less developed countries (LDCs). DCs are characterized by high productivity while the LDCs are characterized by low productivity. Drawing lessons from the Asian tigers becomes imperative for Africa and in particular Nigeria. Nonetheless, there were visible challenges of economic growth for the Asian Tigers in the 1960s and 1970s. However, despite these difficulties, it is important to note that their move from poverty and economic and technological backwardness to relative wealthy and economic and technological modernity over a space of less than forty years has been something of a miracle (Nelson and Pack 1999). Against this backdrop, the need to draw lessons for African countries cannot be minimized. Thus, the objective of this paper is to empirically examine the relationship between economic growth and human capital development using Nigerian data.

This will allow for further justification of the critical importance given to the development of human capital in Nigeria.

1.1 Education Trends and Development in Nigeria

Education affects every individual of a country (Chukwuemeka 2009). The general consensus has been that there is a high positive relationship between rise in educational expansion and economic development. This assertion has been supported by the report of Ashby Commission which in fact favoured the expansion of the educational sector. In 1977, the 6-3-3-4 educational system was put in place to replace the old 6-5-2-4 inherited from the colonial masters. This means that pupils will spend six years to get primary education, six years in secondary school (three years of junior secondary and three years of senior secondary education) and four years of higher education. In Nigeria, the Federal government is principally responsible for the tertiary institutions although, this level of education is also funded by several state governments. Despite the existence of some federal secondary schools, secondary education is mainly a state responsibility while primary education is a local government responsibility. In addition, a National Primary Education Commission (NPEC) exists to draw up the curricula for the schools in this category. Furthermore, the three tiers of government have also collaborated with Non-Governmental Organizations (NGOs), Community-Based Organizations (CBOs), corporate bodies, individuals, religious organizations and international agencies.

In 1980, the level of enrolment in primary school was 12.2 million, which declined to 11.5 million in 1987 (Federal Ministry of Education Report 2000). Thereafter, this figure has increased progressively to 46.3 million in 2010 while the number of primary schools was 82,815 in that year. The student-teacher ratio in primary school which stood at 35: 1 in 1980 rose to 44: 1 in 1986 and then declined in 1990 to 36: 1. From there it rose to 60: 1 in 1995 declining afterwards to 53: 1 in 2003 and increasing to about 63% in 2010. When compared to the United Nations stipulated minimum of 25: 1 it is seen that Nigeria has not performed well. Also, post-primary enrolment was 1.0 million in 1980, rose further to 3.4 million in 1984. By 1989, enrolment had

declined to 2.7 million, rising afterwards to 2.9 million in 1990. From 1990, post-primary enrolment had risen steadily, reaching about 12 million in 2010 (Federal Ministry of Education Report 2012). In the same manner, the number of schools rose from 6,001 in 1990 to 11,918 in 2003. The student-teacher ratio increased from 28 in 1980 to 38 in 1984. The figure rose to 40 in 1995 and declined to 37 in 1996. In 2010, the ratio fell to 38 compared to 40 recommended by the National Policy on education. This is a noticeable improvement, which should be sustained.

The number of universities has also increased in the same manner. In spite of the expansion in the educational system, it has been accompanied by structural defects, inefficiency and ineffectiveness which affect the level and utilization of human capital development in Nigeria. The educational system in Nigeria tends to produce graduates who lack job skills for employment than those the economy requires to remain vibrant. This inadequacy has resulted in rising unemployment, decreasing industrial capacity utilization and social security threats posed by jobless youths. Insufficient resource input, consequent low output and overdependence on government as an employer of labour are also problems resulting from low literacy level in Nigeria. Available statistics show that about 48% of Nigerians are illiterate, compared to 40% in China, 33% in Zimbabwe, 23% in Indonesia and less than 20% in Brazil and Mexico (United Nations 2010).

2. CONCEPT OF HUMAN CAPITAL

Human capital refers to the abilities and skills of human resources and human capital development refers to the process of acquiring and increasing the number of skilled persons who have the education and experience which are critical for the economic growth of the country (Harbison 1973). Human capital in Nigeria is produced mainly in the schooling sector. The government uses public resources for education in the schooling sector such as expenditures for books, teaching material and other inputs in the process of human capital formation. Thus, the input in the schooling sector is composed of time spent for education by the individual and of schooling expenditures by the government. The economy is populated by an infinite sequence of non-overlapping generations of individuals. Thus, the types of human capital at disposal differ in the

manner in which they are built up, and in the returns received from them by individuals. The main inputs in building up human capital are individual ability and time spent for education. From the individual point of view, the time available is limited by the expected lifetime duration, which is therefore considered as given by the individual. Also, greater provision of schooling society increases national productivity and economic growth. The individual problem is then which type of human capital to acquire and how much of it. The intergenerational equilibrium is characterized by the interplay of individual optimizing behaviour and aggregate market conditions.

The human capital theory shows how education leads workers' level of cognitive skills and consequently increases their productivity and efficiency. *Theodore Schultz, Gory Bucker and Jacob Mincer* introduced the notion that people invest in education so as to increase their stock of human capabilities which can be formed by combining innate abilities with investment in human beings. Examples of such investments include expenditure on health, education, nutrition and on-the-job training. However, in order to increase the stock of human capital in a given period, gross investment must exceed depreciation resulting from intense use or lack of use, with passage of time. The provision of education is seen as a productive human capital investment, an investment which is considered by the proponents of human capital theory as equally or even more equally worthwhile than physical capital investment. It is established by human capital theorists that basic literacy enhances the productivity of workers in low skill occupations. These theorists further state that instruction which demands logical and analytical reasoning and which provides technical and specialized knowledge increases the marginal productivity of workers in high skill professions and positions. Also, greater provision of schooling society increases national productivity and economic growth.

2.1 Brief Review of Related Literature: Growth Models

The contributions by Uzawa (1965) and by Lucas (1988) reveal that the representative individual decides how much of his available time is spent for producing physical output and how much is used for the formation of human capital.

Rebelo (1991) extended this class of models by assuming that both physical capital and human capital enter the production process of human capital, in contrast to the model by Uzawa and Lucas who deduce that human capital formation is the result of human capital input alone. However, neither of these models allows for public spending in the process of human capital formation. Contributions, which acknowledge that the public sector can stimulate the formation of human capital by devoting public resources to schooling, include: Glomm and Ravilumar (1992), Ni and Wang (1994), Beauchemin (2001) and Blankenau and Simpson (2004). In those contributions, human capital accumulation results either from both private and public services, as in Glomm and Ravilumar and in Blankenau, or from public spending alone, as in Ni and Wang and in Beauchemin.

However, Solow (1957) in his paper introduced the influence of technological progress on the production process. The model introduces total factor productivity growth, represented by parameter A , which is sometimes also referred to as the available technology stock. The basic Solow model's production function exhibits constant returns to scale and is assumed to be capital-augmenting or Solow-neutral technology, as seen in the following Cobb-Douglas production function:

$$Y = f(K, AL) = AK^\alpha L^{(1-\alpha)}$$

Where Y equals the level of output in a given period,

A = an index for the level of total factor productivity,

K = the available level of physical capital,

L = the available labor supply and finally

α = is a parameter that represents the capital elasticity w.r.t. output.

Because the researcher is primarily concerned with productivity growth per worker, it is required to restate the above production function in per worker terms:

$$y = AK^\alpha$$

The neo-classical theory of growth developed by Solow (1957) centred macroeconomists' attention throughout the 1960's and 1970's on tangible (physical) capital formation as the driver of economic growth. However, the theory showed that, the accumulation of capital would not indefinitely support a steady rate of growth in labour productivity due to the decreasing marginal returns in substituting physical capital for labour. The recent literature on "endogenous eco-

economic growth” emerged primarily as an attempt to encompass the sources of technological progress and hence of sustained productivity growth *within* the general equilibrium framework of neoclassical growth theory. In the literature, several distinct explanations of the process of economic growth are provided, each of which carries particular empirical and policy implications. Romer’s “AK model” generates sustained growth by assuming that technological change is the unintended result of specializing in investments by firms. Creating the capacity to produce additional specialized intermediate products is assumed to work like Adam Smith’s principle of division of labour, but at the aggregate level. Also, the resulting externalities yield increasing returns to cumulative investment, and thus the production of goods can avoid the decreasing returns to rising capital-intensity that the neoclassical model posited. In addition, these externalities imply that the competitive equilibrium growth path does not coincide with that which could be achieved in an optimally planned economy.

The latter conclusion was reached by virtually all the theoretical analyses based upon successive formulations that belong to the family of “endogenous growth models”. This implies that policy action might improve growth performance. Subsequently, through the *explicit* introduction of human capital and/or knowledge, endogenous growth models have fleshed out the process of technological change:

1. Lucas (1988) asserts that human capital is not fundamentally different from physical capital. It is considered as another input in the production function, formed by workers through certain activities (principally education or on-the-job training). By assuming that human capital formation has constant returns – based on the argument that workers’ knowledge “spills over” – the model can achieve a positive steady-state rate of growth in labour productivity.
2. A second line of analysis focuses on modeling other important activities pursued by skilled labour, especially innovation while shifting attention away from treating human capital as a direct input to the production of goods. The main form of technological change recognized by the endogenous literature following Romer (1986, 1990) is that which results from R&D

investment that creates a greater variety of goods, or improves the quality of existing investments.

This latter line of analysis brought out the significant point that when human capital is modelled as a factor affecting innovation, the long-run rate of productivity growth is positively affected by the human capital stock’s level; whereas, in the Lucas (1988) model, the rate at which human capital is being accumulated, relative to the existing stock, was seen as the critical determinant of productivity growth. However, the early growth models (Harrod 1939; Domar 1946; Solow 1996) explained the long-run growth path of advanced capitalist economies in terms of technological progress and accumulation of capital. These models were solely concerned with growth in income. From the perspective of a developing country, the model has limited relevance to the extent that increased accumulation of capital is the basic condition for the growth of economies. Development theories from earlier times accepted the importance of structural transformation in the process of economic development (Lewis 1956; Fei and Ranis 1996). Through stylized facts of development, these models also explained the importance of attaining structural transformation in developing economies. In addition development economics gained an added thrust with the publication of Sen (1973, 1984, 1985). Sen divided the whole concept of development in terms of commodities and capabilities by emphasizing the importance of capabilities over commodity approach. He also acknowledged that GNP is a measure of the amount of the means of well-being of people, but it does not reveal what the people are doing to progress from achieving their means, to their ends. It can be deduced from the writings of Sen, that achieving development cannot be a matter of quantifying income alone, but has to be incorporated with the actual achievement themselves.

Developments in the growth theory have started acknowledging the importance of development variables. For example (Romer 1982) tries to incorporate some of the development variables like human capital, into the growth framework. Recently empirical cross country studies (Young 1995) also acknowledge the importance of increased participation in the labour force, educational improvement and intersectoral transfer of labour from agriculture, as earlier parts of development thinking. Thus, the

tendency of convergence between growth economics and development economics has increased. Attempts have also been made to relate these two concepts of economic growth and human capital development empirically (Ranis and Stewart 2001). The focus of this study is on the two-way relationship between economic growth (EG) and human capital development (HCD). The study views HCD as the central objective of human activity and EG as a very important instrument that has the potential for advancing it. Likewise, achievements in HCD can by themselves make a critical contribution to EG. Therefore, two distinct causal chains are examined. The first one runs from EG to HCD, as the resources from national income are allocated to activities contributing to HCD, while the second chain runs from HCD to EG. This indicates how, human capital development helps increase national income in addition to being an end in itself.

Howbeit, the literature on endogenous growth theory has stimulated economists' interest in empirical evidence bearing on cross-country comparisons of the existing relationships between human capital formation and the growth rate of real output. Some growth models view human capital as a simple input to production. They predict that growth rates will be positively associated with changes in the stock of education. However, models in which human capital plays a role in the development of innovations and its diffusion throughout the economy assume that it is the stock (rather than the flow) of human capital that affects the overall productivity growth rate of the country. One force of sustained per capita growth in endogenous growth models is human capital. The literature on human capital formation is abounding with partial equilibrium analyses of production and cost functions of education (Prakash and Chowdhury 1994). The studies dealing with the production function of education measure output in terms of enrolments and inputs in terms of number of teachers employed and value of non-teaching inputs. Such production functions are useful in determining whether the production of education is subject to increasing, constant or diminishing returns and the relationships between the marginal productivities of the teaching and non-teaching inputs. Human capital theory views schooling and training as investment in skills and competences (Schultz 1992). It is argued that as a way of augmenting their productivity, individuals make decisions on

the education and training they receive based on national expectation of return on investment. A related strand of studies lays emphasis on the interaction between the educational/skills levels of the workforce and measurements of technological activities (Nelson and Phelps 1966). This theory stipulates that with a more educated/skilled workforce, it becomes easier for a firm to adopt and implement new technologies, thereby boosting the returns derived from education and training.

In order to determine the dynamic evolution of output, the Solow-Swan and Ramsey models suggest that it is sufficient to use the equation describing physical capital accumulation. When human capital is included, it is necessary to consider an additional sector where the growth of human capital takes place in order to specify the growth path. Since physical capital has diminishing returns, the requisite assumption for the model to exhibit a positive growth rate of output per worker in the steady state is that the "technology" for generating human capital has constant returns. This means that whatever the level of human capital attained, the growth of human capital is assumed to be the same for a given level of effort. Based on this assumption, output growth rate (per worker) is positive and increasing in the productivity of education or on-the-job training in the creation of human capital. Azariadis and Drazen (1990) model the mechanism of human capital transmission across generations in the more plausible framework of an overlapping generation's model (Lucas followed Ramsey in the simplifying assumption that firms and households are infinitely lived). These models stipulate that the human capital accumulated by the previous generation is inherited by agents. They then decide how much time to devote to training young graduates in acquiring further skill in technology that increases the quality of their labour, and in so doing affect their marginal productivity when they are older. In deciding its own human capital investment, a given generation does not take into account the inter-temporal spill-over effect upon the human capital endowment of future generations. As such, a technological externality occurs, which can result in constant or increasing returns to human capital at the social level. This outcome could be attributed to the impossibility of contracting with the future generations and is sometimes referred to as allocation inefficiency due to "incompleteness

of markets". This problem affecting human capital investment comes from a source which is rather different from the set of conditions previously seen to impair the allocative efficiency of markets that do exist.

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. In his model, it is assumed that after making their investments in human and physical capital respectively, workers and firms are randomly matched with one another. This random matching has a direct consequence of increasing the expected rate of return on human capital in the expected amount of (complementary) physical capital with which a worker will be provided; likewise, there will be an increase in the return on physical capital in the average human capital that the firms expect the workers to bring to the job. Therefore, increasing education for a group of workers induces the firms to invest more in tangible assets, thereby ensuring that the return to all workers in the economy is increased. The model is also seen to imply in a similar argument, that there are "social increasing returns" in physical capital.

2.2 Empirical Evidence

Early studies of the effects of human capital on growth, such as Mankiw et al. (1992) and Barro (1991), were based on data sets from the post-1960s era pertaining to a very diverse array of (more than 100) countries. Narrow flow measures of human capital were used such as the primary and secondary school enrolment rates and it was found that these and output growth rates were positively associated. A report by Barro stated that the catching up process was firmly linked to human capital formation: only those poor countries with high levels of human capital formation relative to their GDP tended to catch up with the richer countries. Barro and Sala-i-Martin (1995: Ch.12), among many others, have also included life expectancy and infant mortality in the growth regressions as proxies for tangible human capital in order to complement the intangible human capital measures derived from school inputs or cognitive tests considered; in their findings, it is evident that there is a strong positive relationship between life expectancy and growth.

More robust results were reported in a survey by Krueger and Lindahl (1998) from the econometric studies of cross-country growth equations. First, growth rates do not seem to be affected by changes in the human capital stock as suggested by the model in Lucas (1998). This contrasts with the robust evidence from the micro literature on the effect that education has on income. Having made allowances for measurement errors, it is found that there is a positive correlation between the change in stock measures of education and economic growth. Secondly, although the evidence regarding the positive effect of the level of human capital stock on growth rates is much stronger, the size of this effect varies across countries. Two other well-established results that emerged from the cross-country studies examined by Krueger and Lindahl are: (a) the greater effect of secondary and higher education on growth, compared with primary education, and (b) the negative or insignificant effect that female education seems to have on the growth of output. Regarding the latter, they concur with Barro (1999) in suggesting that the insignificant effect of female education may be a result of gender discrimination in the labour markets of some countries. The contention is that although females in these countries receive education, they are unable to contribute to the growth of output because they are discouraged from participating in the labour market. Apart from this problem, it appears that there are other mechanisms also at work. In countries with high female participation in the labour market, variations that exist in the level of female education have an insignificantly small positive effect on output growth rates.

While there is persuasive evidence about the positive relation between initial human capital levels and output growth and (weaker) empirical support for the relationship between changes in human capital and growth, it is unclear whether there is a causal relationship between human capital and growth. Bils and Klenow (2000) suggest that the causal direction may run from growth to schooling. Inspired by the fact that there has been a dramatic increase in schooling in the last 30 years at the same time that the "productivity slowdown" became manifest in many of the higher income economies, a Mincerian model would predict that relationship by asserting that growth leads to lower discount rates in the country thus increasing the demand for schooling.

Both variables may of course be driven by other factors. Based on results from various empirical tests, it was deduced by Bils and Klenow that the link from schooling to growth is too weak to explain the strong positive association found by Barro (1991), and Barro and Lee (1993), as described above. But, they argue, the “growth to schooling” connection is capable of generating a coefficient of the magnitude reported by Barro. Lucas (1988), retains other elements of the neo-classical growth model but includes human capital as an additional input in the production of goods. This model assumes that the output of the economy can be generated by using the labour force to accumulate human capital and combining it with physical capital. One version of the model assumes that human capital is acquired through time spent in an educational process that is (non-productive). This means that a trade-off is introduced for workers between employing time to produce output and using it to gain further human capital that will increase their marginal productivity when working in subsequent periods.

It is also evident in another version of the model that on-the-job training can enable workers gain human capital and so their productivity is increased later on by the time employed working. In the case of education, human capital accumulation involves a sacrifice of current utility in the form of less current consumption, or in the case of on-the-job training, a less desirable mix of current consumption goods is considered.

In the 1990's and early 2000's pioneering econometric studies (based on international panel data for a widely diverse array of countries during the post-1960 era) provided empirical support for the conclusion that human capital formation was among the factors that significantly affected the aggregate level rate of economic growth. It was found that successfully catching up internationally in terms of GDP growth was positively related to the overall social rate of human capital formation. Moreover, the countries which were poor and had the tendency of catching up with the higher income economies were restricted to those that were maintaining levels of investment in formal education which were high in relation to their respective GDP levels. Three robust empirical findings have been revealed in more recent econometric studies:

a. The hypothesis that changes in the human capital stock affect growth rates has weak empirical support.

- b. The hypothesis that the relative level of the stock of human capital (in relation to the labour force or aggregate output) has a positive effect on growth rates has a strong statistical support.
- c. The magnitude of the “level effect” of the human capital stock is itself far from uniform across the distribution of economies; the impact on growth rates does not vary linearly with the relative size of the stock but, instead, becomes proportionately smaller among the economies where the average educational attainment is already high.

The broad interpretation of these findings in the context of recent growth models is that raising the general level of educational attainment interacts positively with other forces — among them the accumulation of complementary physical capital and the application of new technologies. This higher intensity of human capital permits countries to accelerate their productivity growth rate and narrow the relative size of the per capita real income gaps separating them from the leading economies. Maintaining a high average level of educational attainment, and correspondingly high rates of investment in other forms of human capital (for example, health, internal spatial and occupational mobility), would appear to serve as a *stabilizing* force — although not a guarantee — against continuing secular decline in a country's relative per capita income position. Nonetheless, most of the theoretical literature on economic growth focuses on the role that investment in formal education plays in modern economies.

Regarding the empirical relevance of human capital, there is evidence that education is positively correlated with income growth. At the microeconomic level the positive correlation seems to be quite robust. On the macroeconomic level the findings are more fragile (Krueger and Lindahl 2001) which, however, may be due to measurement errors. Krueger and Lindahl demonstrate that cross-country regressions indicate that the change in education is positively correlated with economic growth if measurement errors are accounted for. Further, Levine and Renelt (1992) have shown that human capital, measured by the secondary enrolment rate, is a robust variable in growth regressions, so that building endogenous growth models with human capital as the engine of growth seems to be justified. When

the government can influence the process of human capital formation by adequate expenditures, it may finance these measures by the tax revenue and by public deficits. As concerns deficit finance of productive public spending in endogenous growth models with an infinitely lived representative individual, one realizes that a deficit financed increase in public spending leads to higher long-run (Greiner n.d). The reason for this outcome is that deficit finance of the government does not have any distortions in the model with an infinitely lived individual. Consequently, the growth stimulating effect of higher productive spending dominates and leads to a higher balanced growth rate.

3. MODEL SPECIFICATION AND ANALYSIS

The researcher is adopting this therefore, the framework of Ranis and Stewart as an analytical base but will adopt and examine only the chain which runs from HCD to EG. The focus of the investigation will be to determine whether HCD via increased public expenditure on social sector activities, education (enrolment in primary, post-primary, and tertiary institutions) and gross capital formation lead to higher EG.

From the review of other empirical works, the basic macroeconomic variables of concern were derived which include: real gross domestic product growth rate, capital expenditure on education, recurrent expenditure on education and real gross capital formation was used to proxy physical capital formation. Enrolments into primary, post-primary and tertiary educational institutions were used to proxy human capital development. Human capital development is proxied by the three components of enrolments in educational institutions. These three variables were included in order to examine their individual impact on the economic growth process. Labour force would have been introduced, but there was no sufficient data on this variable to allow for estimation.

With the aid of Econometric Views Software, the model is estimated using annual data from 1970-2010. The statistics were compiled from various issues of the Central Bank of Nigeria (CBN) Annual Report, CBN Statistical Bulletin, Major Economic, Financial and Banking Indicators, Federal Office of Statistics' Economic and Statistics Review (various issues).

Estimation procedure follows the two steps procedure of Engle and Granger (1987), Granger (1986) and Hendry (1985). The ordinary least squares method (OLS) was adopted as the estimation technique through stepwise regression in order to avoid multi-collinearity of explanatory variables. The application of the cointegration theory incorporating the error correction mechanism was explored. In this process, the time series characteristics of the variables selected was examined, and the problems of spurious correlation often associated with non-stationary time series was overcome. Concurrently, long-run equilibrium relationships were generated. In order to achieve linearity, the variables were examined in logarithmic forms. As the starting point to assess the order of integration, the Augmented Dickey Fuller (ADF) was used to test the data series for stationarity and results presented in Table 1 (Unit Root Tests).

Table 1: Results of Unit Root Tests

Variable	ADF lags	ADF-test statistics with constant	Critical value at 5%	Order of inte- gration
DLRGDPG	1	-3.2534	-3.1012	I(1)
DLCE	1	-4.2376	-3.0125	I(1)
DLRE	1	-4.5854	-3.0122	I(1)
DDLRGCF	1	-4.0981	-3.1591	I(1)
DDLPRYE	1	-4.8534	-3.0188	I(1)
DLPPE	1	-3.1821	-3.0225	I(1)
DDLTERE	1	-4.1291	-3.0235	I(1)

Based on the discussion above, the following model is specified in order to determine the impact of human capital formation on economic growth in Nigeria.

In functional form,

$$RGDPG = f(CE, RE, RGCF, PRYE, PPE, TERE) \dots (1)$$

Where:

RGDPG = real gross domestic product growth rate

CE = capital expenditure on education

RE = recurrent expenditure on education

RGCF = real gross capital formation

PRYE = primary education enrolment

PPE = post-primary education enrolment

TERE = tertiary education enrolment

Taking the natural logarithmic of both sides of equation (1) and assuming linearity among the variables gives:

$$\begin{aligned} \text{LRGDPG} = & a_0 + a_1 \text{LCE} + a_2 \text{LRE} + a_3 \text{LRGCF} + a_4 \text{LPYE} \\ & + a_5 \text{LPPE} + a_6 \text{LTERE} + U \dots \dots \dots (2) \end{aligned}$$

A's are coefficients to be estimated and their a-priori signs indicate that all the coefficients are positively related to RGDPG. While U is the random error, with mean zero and constant variance.

From the static regression of the model using the variables at their levels, residuals were generated for these variables and their stationarity status was confirmed, which implies that the variables have been cointegrated. The linear combinations of the variables of non-stationary series I(1) should themselves be stationary in order for integration to be accepted.

The RESID1 is accepted which implies that the model is best specified in the first difference. See Table 2 for results. The essence of this procedure is to prevent the loss of information from long-term relationships in further differencing.

Table 2: Result of the unit root test for the residual

Variable	ADF-test statistics with constant	Critical value at 5%	Order of integration
ECM(-1)	-4.1962	-3.2136	I(0)

The short-run adjustment dynamics is specified by incorporating the error correction mechanism (ECM). The autoregressive distributed lag technique was used by incorporating a highest lag of 3. This was done to obtain the over-parameterized equation. Finally, through step-wise regression and by deleting those variables that are not consistent with theory, the regression result obtained was parsimonious as shown in Table 3.

3.1 Analysis of Findings

The above result shows that the R^2 is 0.84, which indicates that about 84 per cent of the variations in RGDPG are explained by the model. It was also found that there is a positive coefficient of lagged RGDPG and it is statistically significant at 5 per cent level. Regarding education, recurrent expenditure on education is significant at 5 per cent and rightly signed. Empirically, this shows that economic growth is accelerated by investment in human capital. However, capital expenditure did not show any significant impact on economic growth. This could be attributable to the index of utilization of expenditure in the country, which is very low at the moment.

Table 3: Parsimonious Regression Result

Variable	Coefficient	T-Statistic
Constant	-0.132**	-2.683
DLRGDPG(-1)	0.265**	1.893
DLCE	-0.127	-1.875
DLRGCF	0.039*	2.631
DLRE	0.048**	-1.985
DLRE(-1)	-0.0263	-1.667
DLRE(-2)	-0.0231	-1.386
DLPRYE	1.967**	2.274
DLPPE	1.489*	3.482
DLPPE(-1)	-0.992*	-3.107
DLTERE	0.636	1.213
DLTERE(-1)	-0.360	-0.857
RESID(-1)	-0.7806*	-6.763

Please note that * and ** shows that the variables are statistically significant at 1 per cent and 5 per cent critical levels, respectively.

$R^2 = 0.84$

Adj. $R^2 = 0.75$

F-Statistics = 8.652

DW = 1.995

Considering PRYE, the result validates the expected positive relationship between RGDPG and this variable. Also, at 5 percent, its coefficient is statistically different from zero, indicating that there is a significant impact on economic growth. It is observed that the variable for post-primary education enrolment is statistically very significant at 1 per cent and is positively related to economic growth. Although the t-statistic result indicates that it is statistically significant at 1 per cent, the coefficient of its lag is negative. The result from tertiary education enrolment shows that although the parameter estimate is not significant, it has the correct sign indicating that it is positively related to economic growth. Some of the factors that could be associated with this result include: incessant strikes, disruption of academic activities, weak infrastructure, inadequate funding and consequent decay in most of the tertiary institutions in the education sub-sector in Nigeria.

As expected, the RESID is largely negative at 1 per cent level of significance. Therefore, any deviations from the long-run equilibrium relationship between RGDPG and the explanatory variables could be corrected by the RESID. At 1.995, the Durbin Watson statistics does not suggest evidence of auto-correlation. The F-value of 8.652 is significant at the 1 per cent level, indicating that the variations caused on economic growth are approximately explained by the variables included in the model.

4. CONCLUSION

Health and education are both components of human capital and contributors to human welfare. One index of human welfare, which incorporates income, education and health, shows that Africa's level of 'human development' is the lowest of any other region in the world. As Africa has found since 1980, slow economic growth severely limits the ability of governments and households to fund further investments in health and education. Low investments in human capital may impinge on already low growth rates of income. Such interrelations might be thought to imply a vicious circle of development.

In conclusion, Nigeria can only reposition herself as a potent force through the quality of her products from all levels of education including (primary, secondary and tertiary schools) as well as making her manpower relevant in the highly competitive and globalized economy through a structured and strategic planning of her educational institutions.

5. RECOMMENDATIONS

By using cointegration and error correction technique, the paper has explored empirically the relationship between economic growth and human capital development in Nigeria. It succeeded in revealing that human capital investment through education and capacity building in form of training has an impact on economic growth. Nigeria should strive for a rapid growth of main aspects of human capital - particularly in the expansion of education - despite starting from a low level of income. The expansion of the human capital stock should also be matched by a commensurate rise in physical capital. The resultant effect would be high growth of income and high returns to the educational investment.

The on-going reform by the Federal Government relating to the education sector (increasing primary school enrolment through the free compulsory Universal Basic Education) should be sustained with great commitment and will. Furthermore, Government should continue to provide enabling environment by ensuring macro-economic stability that will encourage increased investment in human capital by individuals and the private sector. In-addition, expansion of institutional capacity through strengthening the infrastructure of educational institutions will produce quality manpower.

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