Human Capital Development and Economic Growth: Empirical Analysis of Nigeria Experience

OGUNRO,
Victor Olukayode (Ph.D.)

Department of Business
Administration and Management
Rufus Giwa Polytechnic, Owo,
Ondo State

olukayodeogunro@yahoo.com

ABSTRACT

This study applied both Ordinary Least Square (OLS) and Generalized Least Square (GLS) methodological framework to investigate the impact of human capital development on economic growth of Nigeria, using annual time series data from 1981-2015. The ultimate empirical result shows that human capital variables included in the model (i.e. EDU, ENROL, and GCF), though positive but weakly impacted on Nigeria economic growth, while fertility rate showed negative sign. The researcher, based on the findings, concludes that though human capital is theoretically underpinned as an engine of growth, in the context of developing economies like Nigeria, it does not really matter except decisive and pragmatic measure are taking by the stakeholders. Hence, enabling environment for human capital formation, research, and development as well as full implementation of United Nation recommendation of 26% GDP ratio allocation to educational sector and among others, are recommended.

Keywords: *Human Capital Development, Economic Growth*

1.0 Introduction

Human capital is a reckoned factor in the economic performance of any nation. This is shown in the level of technological progress in the developed and emerging economies. The economic development body of thinking is of the opinion that improvement of the workforce will result in the generation of productive ideas and decisions, which will significantly and positively impact on investment, innovative tendencies and other opportunities for growth (Roux,1994). The governments of the nations have been more committed to the development of human capital as a pivot to economic development in the area of Research and Development (R&D) and quality education.

However, unlike the ease of making conclusion affirmatively on the positive effect of investment in human capital on economic growth in the developed and emerging economies, in the case of Nigeria, much is left to be explained. This directly translates into the challenge of undertaking this research work. Thus, the main purpose of this research is to analyze empirically, the impact of human capital development on economic growth in Nigeria. The uniqueness of this study is that it presents a comparative analysis of both the OLS and GLS results.

2.0 Literature Review

Theoretically, the mechanism of human capital impact on economic growth is a positive sum game (Oboh, Rahmah & Abu, 2010). Adenuga (2002), Temple (1999), Barro, Salai and Martin (1995) emphasized the complementary relationship between human capital development and economic growth. In the same vein, Lucas (1988) submitted that human capital is the engine of growth and that the technology that counts for its production is human capital input itself (Oboh et al, 2010). Human capital as a stock of production of knowledge is a positive factor of growth. It facilitates productivity through the instrumentality of increased knowledge and skills leading to creativity and inventions (Schultz,1961). Justifying Tadora (2000), Oboh et al (2010) posited that human capital development can help to overcome many characteristics of the labour force that act as an impediment to greater productivity such as poor health, illiteracy, unreceptiveness to new knowledge, fear of change, lack of incentive and moralities.

On the empirical note, several studies have been undertaken to investigate the relationship between human capital and economic growth, much of which reveals positive nexus. The work of Sankay, Ismail, and Shaari (2010) investigated the impact of human capital development on economic growth during the period of 1970-2008 and found a significant positive relationship. Consistent with this work is that of Duada (2010), who used the human capital model of endogenous growth developed by Romer and Weil (1992) in Oboh et al (2010) in examining the impact of human capital development on economic growth of Nigeria. He employed unit root tests, co-integration test and

error correction mechanism (ECM) and discovered a long run relationship among physical capital formation, enrolment in educational institutions and economic growth.

Garba (2002), in his empirical review of the theory revealed that cross-country regression has shown a positive nexus between educational attainment and growth. He demonstrated that education and human capital formation were responsible for both the differences in labour productivity and differences in overall level of technology that we observed in the world. More than all else, the spectacular economic growth in the East Asia has been largely traced to investment in human capital (World Bank, 1993). Similarly, Bratti, Bucci & Moretti (2004) established a positive relationship between human capital accumulation and demographic variables. They showed that an increase in life expectancy at birth (as well as fertility rate) brought about an increase in tertiary education.

Ayara (2002) reported that the impact of investment in education on economic growth is less than expected. This, according to him, is attributed to the fact that educational capital has become unproductive; though privately rewardable, it has become socially not productive and that schooling has failed to provide the needed skills for economic transformation. Moreover, the econometric work of Adawo (2011), which examined the impact of educational enrolments, capital formation and among others, was quite revealing. It proved that capital formation is growth improving while tertiary school enrolment is growth repressing. He recommends, among other things, that admission process should be adjusted to favour core and technical sciences. Johnson (2011) employed ordinary least Square (OLS) to explore the relationship between human capital development and economic growth in Nigeria. He proxied GDP for economic growth and school enrolment as human capital. His results established a positive relationship. Likewise, Oluwatobi and Oluranti (2011), with Isola and Alani (2012) consolidated on positive growth- human capital relationship.

On the other hand, Amossoma and Nwosa (2011) in their study of the causal nexus between human capital investment and Nigeria economic growth for sustainable development in Africa between 1970 and 2009 using the methodology of Vector Error Correction(VEC) and pairwise granger causality, no causal relationship was found between the variables. The study identified labour mismatch among others as the problem to be addressed by the government and policy makers. In the same vein, Haoas and Yagoubi (2005) found no causality between human capital development and economic growth. Meanwhile, Lawanson (2009) in his work found that on the average, human capital actually enhanced economic growth in Nigeria, but that primary education enrolment has negative impact on economic growth.

3.0 Methodology

This study employ econometrics method to determine the impact of human capital development on Nigeria economic growth. The framework adopted for the research work was proposed in Loening (2002), which took its roots from augmented Solow theory and extension of Mankiw, Romer, and Weil (1992) with modifications.

There was absence of human capital in the earlier neo - classical model as major input for production but in Solow's (1956) model human capital was incorporated as one of the explanatory variables that determine growth which was attributed to three sources namely: increase in the stock of physical capital, increases in the size of labour force, and a residual representing all other factors. Solow uses the aggregate production function which is

continuous and homogeneous of degree one. **Y = f(L, K, T).....(1)**

Where Y is aggregate real output K is the stock of capital, L is labour and T is Technical change. Technical change is constant. Equation can be now become as:

Y = A*f*(K, L).....(2)

Expressing Equation (2) in growth terms:

$$\frac{dY}{Y} = \left|A\frac{dY}{dL}\right|\frac{dk}{Y} + \left|A\frac{dY}{dN}\right|\frac{dN}{Y} + \frac{dA}{A} \quad \text{.....(3)}$$

For estimation purpose equation 3 can take this form:

$$\frac{\Delta Y}{Y} = \alpha_0 + \alpha_1 \frac{I}{Y} + \alpha_2 \frac{\Delta N}{Y} \quad \text{.....(4)}$$

$\alpha_0 = \alpha_1 = \alpha_2 =$

$\frac{I}{Y}$ = dK = change in capital (investment)

$\frac{\Delta N}{Y}$ = ratio of investment to income = ratio of change in population to income

The constant term (α_0) is assumed to capture the growth in productivity, at is the marginal productivity of capital, and α_2 is the elasticity of output with respect to population. Therefore, with this background, the model can be formulas:

$$G_y = \alpha_0 + \alpha_1 G_K + \alpha_2 G_L + \mu \quad \text{.....(5)}$$

Where: G_y = Growth rate of real **GDPGk**= Growth rate of capital **GL** = Growth rate of labour μ=disturbance term

The α's are coefficients to be estimated and their signs are expected to be positive in order to examine the impact of education and health on economic growth.

The Model Specification

For the purpose of this research the model ~~was~~ specified more precisely as shown below;

The Generalized Least Squares (GLS) regression model, as specified below, will be used and Augmented Dickey Fuller (ADF) unit root test will be employed to determine the stationary status of the variables of the model. Co-integration technique will be used for the variables, thus establishing the time series properties of the variables in the model. Secondary data will be sourced from Central bank of Nigeria (CBN) and World Development Indicators (WDI) as well as journals from other economic and financial institutions.

Generalized Least Square (GLS)

Since Ω *is* a positive definite symmetric matrix, it can be factored into

Ω= C^C

Where the columns of C are the characteristic vectors of Ω and the characteristic roots of Ω are arrayed in the diagonal matrix ^. Let $^{1/2}$ be the diagonal matrix with *i*th diagonal element $\sqrt{\lambda_i}$,and let **T = C**$^{1/2}$.Then Ω = **TT'**. Also, let **P'** = **C**$^{1/2}$, so

Ω^{-1} = **P'P** Pre-multiply the model

y = X***B*** +ε to obtain

Py= **PX*B*** + **P**ε

or

y* = X****B*** +ε*.. 1

The variance of ε*is

E [ε* ε*'] = P□2 Ω P_ = □2.....2

so the classical regression model applies to this transformed model. Since Ω is known, y*and X*are observed data. In the classical model, ordinary least squares is efficient;

Hence,

$\hat{\beta}$ = (X'*X*)$^{-1}$X'*y*

= (X'P'PX)$^{-1}$X'P'Py

= (X'Ω^{-1}X)$^{-1}$X'Ω^{-1}y

is the efficient estimator of ***B***. This estimator is the **generalized least squares (GLS)** or Aitken (1935) estimator of ***B***. This estimator is in contrast to the ordinary least squares (OLS) estimator, which uses a "weighting matrix,"**I,** instead of Ω^{-1}. By appealing to the classical regression model in equation (1), we have the following theorem, which includes the generalized regression model.

For testing hypotheses, we can apply the full set of results of the transformed model in equ(l) For testing the *J* linear restrictions **Rβ** = **q,** the appropriate statistic is

$$F[j, n-k] = \frac{(R\hat{\beta}-q)'[R\sigma^2R(X'X)^{-1}R']^{-1}(R\hat{\beta}-q)}{J} = \frac{(\varepsilon'_*\varepsilon_* - \varepsilon'\varepsilon)/J}{\sigma^2}$$

Where the residual vector isε= y* - X*$\hat{B}$and

$$\sigma^2 = \frac{\varepsilon' \varepsilon / J}{n-k} = , \frac{(y-x)\Omega^{-1}(y-X\beta)}{n-k}$$

For the purpose of this research the model will be specified more precisely as shown below;
Functional form:
RGDP = f (EDU, FERT, GCF,ENROL).. (6)
Where: **RGDP** - Real Gross Domestic Product
EDU- Total Government Expenditure on education
FERT—Fertility RateENROL-Total tertiary institution enrolment
GCF- Gross Capital Formation
Equation Form:
RGDP = Q_0+niEDU+n_2FERT+n_3GCF+Q4ENROL+p (7)
A priori expectations for each parameter are positive. i.e. Qi, Q2,o_3 and o_4> o

4.0 Analysis And Presentation Of Empirical Result

The time series variables used in the study are presented graphically (see appendix). However, the pattern of fluctuation of the data series are lucidly captured in order to understand their contributions to human capital development in Nigeria between the periods 1981 and 2015.

Unit Root Test

In order to know whether the stochastic process of the variables of the model is stationary, that is, whether their means and their variances are constant over time, this study employed the Augmented Dickey-Fuller (ADF) tests. The null hypothesis investigates if the variable under investigation has a unit root against the alternative that it does not (that is, it is stationary). Specifically, the ADF, lag-length is chosen using the Akaike Information Criteria (AIC) after testing for first and higher order serial correlation in the residuals. Table 1 below shows the result of unit root test in the level variables as well as their first difference. It also shows the estimated t- statistics cum probability value at 5% significant level.

The unit root test for the variables at level shows [i.e. l(0)] the null hypothesis that each variable has a unit root cannot be rejected. However, after applying the first difference, the test rejects the null hypothesis, as shown in the table. Since the data appear to be stationary in first differences [1(1)], no further tests are performed, therefore, it can be concluded that each variable is integrated of order one. At this stage, we can apply the OLS method without being worried about misleading inferences in the presence of spurious correlation (Granger

and Newbold, 1974).

Table 4.1 Results of unit roots test

Variable	Statistic	p-values	Order of integration
RGDP	0.986	0.9941	I(0)
	-4.026	0.0081	I(1)
EDU	0.352	0.9796	I(0)
	-4.112	0.0061	I(1)
ENROL	-2.255	0.1869	I(0)
	-4.515	0.0014	I(1)
FERT	-2.042	0.2683	I(0)
	-4.255	0.0037	I(1)
GCF	0.012	0.9595	I(0)
	5.479	0.000	I(1)

Researcher's computation (2017) using STATA
**The critical values of t- statistics for the ADF are -2.966 and -3.572 at level and first difference *I(0)& 1(1) - at level and first difference respectively*

Engle-Granger (EG) or Augmented Engle-Granger (AEG) Co-integration Test

This is used in this study to test the long run relationship among the selected human capital development and economic growth variables. It is obtained by testing the stationary of the structural equation residual terms by applying Augmented Dickey Fuller test. Therefore, ADF tests in the present context are known as **Engle-Granger (EG)** and **augmented Engle-Granger (AEG)** tests. Under this test, if the residual obtained from the linear combination of the variables in question is stationary, then there is co-integration, meaning that there is a long run relationship between the variables of the model.

From the table below Since RGDP, EDU, ENROL, FERT, and GCF are individually non-stationary at zero order of integration, there is the possibility that this regression is spurious. But when unit root test was performed on the residuals obtained from the specified regression equation, it gave the test statistics of -5.816 which is greater than the critical value of -3.376 (in the absolute term). However, the conclusion is that the residuals from the regression are of /(0); that is, they are stationary. Hence, the regression is not spurious, even though individually, the variables are non-stationary at level.

Residual	t-stat	p-value	Order of integration
	-5.816	0.000	1(0)

Researcher's computation (2017) using STATA
**The critical values of t-statistics for the ADF are -2.966 and -3.572 at level and first difference *l(0)& 1(1) - at level and first difference respectively*

Pair-Wise Correlation Matrix

Table4.3 below shows the result of the pair-wise correlation between the variables. It reveals a strong correlation between the real GDP and each of the control variables but weak relationship between the various forms human capital development indices used in the study. The positive relationship signs on each of the partial correlation coefficient are as expected. In addition, this test helps to check for the degree of multi-co-linearity among the variables, the test was carried out using the correlation matrix. According to Barry and Feldman (1995) criteria "multi co-linearity is not a Problem if no correlation exceeds 0.80". From the table below, it is obvious that multi-co-linearity problem does not exist between the explanatory variables as the values of the correlation coefficient is far less than 50%.

Table 4.3: Pair-wise Correlation between Variables (Correlation Matrix)

	RGDP	EDU	ENROL	D.FERT	D.GCF
RGDP	**1**				
EDU	**0.8864**	**1**			
ENROL	**0.6933**	**0.4272**	**1**		
D.FERT	**0.2463**	**0.1140**	**0.5010**	**1**	
D.GCF	**0.3683**	**0.1318**	**0.4861**	**0.1.28**	**1**

Researcher's computation (2017) using STATA

The Regression Result

The regression result for the estimation of the impact of human capital development on Nigerian economic growth is shown in Table 3 below.

Table 4.4 ordinary Least Square (OLS)

Variable	Coefficient	Std.err	T	p-value
Edu* **	2.53e-07	2.08e-08	12.13	00000
Enrol* **	0.0000466	0.000011	4.13	0.0000
d.fect	-13.73829	52.64224	-0.26	0.796
d.gcf	7.59e-09	4.32e-09	1.76	0.057
Constant	477.5589	240.578	1.99	0.057
R^2		0.9053		
Prob(f-statistic		0.0000		
Durbin Watson		0.9753052		

Researcher's computation (2017) using STATA Dependent variable: RGDP
*p< 0.05, **p< 0.01, *"p< 0.001 **F-stat**= 79.84

From the results in table 4.4, the coefficient of the constant is positive, showing that if the variables captured by the model are held constant and other determining variables outside the model are varied by one unit, it will produce 477.6 unit changes in the GDP. Furthermore, government expenditure on education (EDU) appeared to be positive and statistically significant with respect to its impact on the economic growth (GDP) of Nigeria. The result indicated that a unit increase in EDU will improve the GDP by 2.5 units. This is consistent with the work of God'stime and Uchenchi (2014), and Adenuga (2002) who established that Education matters for growth in developing economies. However, it is at variance with that of Oladeji (2015) who found a negative nexus.

Moreover, total tertiary school enrolment (ENROL) is found to bear a positive impact on Nigeria economic growth. Although the effect is statistically significant, the magnitude of its impact is not significantly differentiable from zero. This vindicates the report by World Bank (2010), which mentioned undesirable tertiary school enrolment amongst others as a clog to the wheel of Nigeria economic growth.

In addition, the fertility rate (DFERT) is found to be GDP repressing in Nigeria situation, such that a unit increase in DFERT would pull down GDP by 13.72 units. However, this effect is not statistically significant. On the part of Gross Capital Formation (GCF), its impacts on GDP is found to be positive. The result shows that 7.59 units increase in GDP would be realized by a unit increase in DGCF. Given the associated "t" calculated value of 1.76 with

P-value of 0.089 (8.9%), it indicated that the effect of DGCF is not statistically significant at 5%.

The coefficient of multiple determination denoted by R^2 which is the explanatory power of all the determining variables included in the model with the value of 0.917 (2%) indicates that the overall goodness of fit is quite satisfactory. It explains that the estimated equation captures about 92% of the systemic variations in the GDP of Nigeria. Equally, the adjusted R^2 (R^{-2}) value of 0.905 (91%) shows that R^2 is not overstated since it does not differ much from R^2. Moreover, the observed F-statistics value of 79.84 with P-value 0.0 shows that the overall model is perfectly significant.

On the other hand, the value of D.W statistic of 0.98 suggests that the model suffers from the problem of autocorrelation. This will be corrected later in this research by the introduction of Generalized Least Square (GLS) estimation technique. The presence of autocorrelation is a major problem in time series data analysis, the problem of serial correlation observed in the regression result above will be corrected using Generalized Least Square (GLS) regression model as presented below; The method has been found suitable in correcting autocorrelation problem.

Variable	Coefficient	Std.err	T	p-value
(1) Edu***	0.0009967	0.0000835	11.93	0.0000
(2)enroll***	0.1334721	0.034755	3.84	0.0000
(3)d.fert	-137751.3	190062.9	-0.72	0.469
(4) d.gcf**	0.0000369	0.0000132	2.76	0.005
Constant	-957408.6	799711.3	-1.20	0.231

Researcher's computation (2017) using STATA Dependent variable: RGDP
*p< 0.05, * p< 0.01, * p< 0.001

The regression result in table 4.5 captured a better relationship of the variables in the model. Apart from correcting the problem of autocorrelation, it increased the number of significant explanatory variables from two to three, (i.e. EDU, ENROL and D.GCF). Furthermore, it also reveals some salient truth about the true relationship that exists between Nigeria GDP and the explanatory variables in the estimated model. First, it shows that both investments in education (EDU) and Gross Capital Formation (D.GCF) are weak determinants of growth in Nigeria. This is because the magnitude of their coefficient (0.001) and (0.0001) are not differentiable from zero. In the same vein, tertiary school enrolment (ENROL) coefficient (0.133) indicates an inelastic relationship with economic growth of Nigeria.

From the result, enrolment rate has the highest impact on human capital development; this is because the increased expenditure on education must translate to increase in the capacity of the educational institution in Nigeria, i.e. the focus is not only on the quality of education impacted but also on the quantity of the educated which will be felt on the aggregate economic performance in terms of large human resource channel and harness to increase output cum aggregate welfare.

5.0 Conclusion and Recommendations

5.1 Conclusion

The research investigated the impact of human capital development on Nigeria economic growth. Using both OLS and GLS estimation techniques, the results showed that three of the human capital variables included in the model (EDU, ENROL, and GCF) are weakly but positively related to growth, while DFERT showed negative sign. Although human capital is theoretically underpinned as an engine of growth and ultimate determinant of the social and economic development of any nation, the findings of this work show it does not really matter for growth in the developing country like Nigeria. This is because of the peculiar intricacies inherent in such economies.

5.2 Recommendations

The bottlenecks of corruption, teaching with obsolete methods, strikes, and administrative hiccups, inefficiencies, brain drain, poor funding etc as reported by World Bank (2010), must be decisively addressed by the government and policy makers before human capital development can be of real significance in the developing economies.

Besides, proper institutional framework must be put in place to provide enabling the environment to absorb the outputs of human capital formation and R & D. This will help check the problem of brain drain, and Nigeria will no longer lose her skilled and professional persons and in return depending on expatriate for many professional jobs. In addition, the challenge of poor funding as identified by World Bank (2010), Omofunwa (2007) and Oladije (2015) have to be addressed. The government must give an impressive commitment to the formation and development of human resources. This can be achieved by implementing the United Nations recommendation that 26% of the total public expenditure be devoted to education and research and Development (R & D). This has the capacity of boosting Nigeria's potential and turn her economy into a lucrative and job-creating economy.

References

Adawo, M. A. (2011). Has education (human capital) contribution to the economic growth of Nigeria? Journal of Economics and International Finance, 3(1), 46-58.

Adenuga A. O. (2002). Educational Expenditure and Performance in Nigeria (1970-*2000*). Proceeding of the Annual Conference of the Nigerian Economic Society: Human Resources Development in Africa, *University of Ibadan, 5(2), 199-222*.

Amassoma, D. & Nwosa.P. I. (2011). Investment in Human Capital and Economic Growth in Nigeria: A Causality Approach. Canadian Social Science, 7(4), 114-120.

Ayara, N. (2002). The paradox of education and economic growth in Nigeria: an empirical evidence. Selected paper for 2002 Annual conference, Nigeria Economic Society (NES).

Barro R, Salai-Martin X. (1995). *Economic Growth. N*ew York: McGraw Hill.

Bratti, M. A. Bucci, & Moretti (2004). Demographic Trends, Human Capital and Economic Growth in Developing Countries; Theory and Evidence University of Ancona, department of Economic Ancona. Italy.

Dauda, R.O. (2010). Role of Human Capital in Economic Development: An Empirical Study of Nigerian Case. Oxford: Oxford Business and Economics Conference Program.

Garba, P. K. (2002). Human Capital Formation, Utilization and the Development of *Nigeria. Selected Papers for the 2002*.Annual Conference of the Nigeria Economic Society. *(NES),* Ibadan.

Godstime O. E. & Uchechi, S. A. (2014). "Human capital development and Economic growth; the Nigeria experience". International Journal of Academic Research in Business and social sciences 4(4).

Haouas I. & Yagoubi M. (2005). Openness and human capital as a source of productivity, Growth; for empirical investigation from the MENA countries" IZA discussion l(1461).

Isola, W. A. & Alani, R.A. (2012). Human Capital Development and Economic Growth: Empirical Evidence from Nigeria. Asian Economic and Financial Review, 2(7), 813-827.

Johnson A. O. (2011). Human capital development and economic growth in Nigeria. *European Journal of Business and Management,* 3(9), 29-38.

Khan S. M. (2005); Human capital and economic growth in Pakistan; The Pakistan Development Review, 44(4).

Lawanson, O. L. (2009). Human capital investment and economic growth and health. Oxford University Press.

Loening J. (2002). Time Series Evidence on Education and Growth: The Case of Guatemala."1951-2002, *Revista de AnalisisEconomico,* 19(2), 3-40.

Lucas, R. (1988): "On the Mechanics of Economic Development" *Journal of Monetary Economics,* 22 (7), 3-42.

Mankiw, G., Romer, D. & Weil, D. (1992). A Contribution to the Empirics of Economic Growth. *Quarterly Journal of Economics,* 107, 407-437.

Oboh J.S., Rahmah I. & Abu H. S. (2010). The impact of human capital development on the economic growth of Nigeria. ProsidingPerkem 5(6).

Oladeji, A. O. (2015). Impact of Human Capital Development on Economic Growth in Nigeria."International Journal of Recent Research in Commerce Economics and Management, 2(2), 151-164

Oluwatobi, S. O. & Oluranti, O. I. (2011). Government Expenditure on Human Capital Development: Implications for Economic Growth in Nigeria. Journal of Sustainable Development, 4(3), 72-80.

Roux, Andre. (1994). Defence, Human Capital and Economic Development in South Africa. *African Defence Review,* 19.

Sankay, O. J., Ismail., R. & Shaari, A. H. (2010). The impact of human capital development on the economic Growth of Nigeria. ProsidingPerkem V, Jilid, 1, 63 -72.

Schultz, T. W. (1961). Investment in Human Capital. American Economic Review, 51, 1-17.

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. The Quarterly Journal of Economics, 70(l), 65-94.

Temple J. (1999). The new growth evidence *Journal of Economic Literature,* 37, 112-156.

Todaro M. P. (2000). Economics for a Developing World, London Longman.

World Bank (1993). *The East Asian Miracle: Economic Growth and Public Policy,* Summary. Oxford University Press, New York.