

Human Capital Accumulation and Economic Growth in Nigeria

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Abstract

This article examines the relationship between human capital accumulation and economic growth in Nigeria. The OLS method of estimation was used for the purpose of estimating the required parameters. Interestingly, the findings reveal that human capital accumulation has a significant and positive impact on economic growth in Nigeria. This study makes an important contribution to the literature on economic growth, particularly those that focus on African countries. We tested for the role of both structural and political institutions. While the estimate of the structural institution exhibits a significant and positive effect on economic growth, the estimate of the political institution exhibits an insignificant and negative effect on economic growth in Nigeria.

Keywords: Human capital accumulation, economic growth, political institution

1. Introduction

The primary objective of this study is to establish the impact of human capital accumulation on economic growth in Nigeria. Since 2001, Nigeria has maintained an average annual growth rate of 5 percent with limited economic transformation. Yet, the Federal Government is committed to its drive for increased foreign investment in the country. In this globalized world, these investments come with horizontal linkages, vertical linkages, and spillovers, such as improved trading opportunities.

Ironically, exploring the opportunities inherent in globalization poses a big challenge to the people of Nigeria. So far, we have witnessed a decline in manufacturing and a corresponding increase in the importation of goods. The World Bank (2011) reports that 84 percent of Nigeria's total imports in 2009 were manufactured goods. Despite the abundant supply of labour in the country, production efficiency, knowledge transfer, technological adaptation, and innovation remain a mirage.

Central to these challenges is human capital. Human capital facilitates international technology transfers, local capacity building, as well as the maximization of the linkages and spillovers that can benefit the domestic economy. Human capital accumulation is not a day's task but it comes with tremendous benefits. The persistent accumulation of knowledge by labour promotes productivity. This, in turn, boosts the growth of output from the domestic economy. If human capital

accumulation has an impact on economic growth, what is the relationship between human capital accumulation and economic growth in Nigeria?

This article is an attempt to answer the question above. The remaining parts of the article are organized as follows. In section 2, we discuss, briefly, empirical reviews of literature on the link between human capital accumulation and economic growth. In section 3, we present the empirical models and discuss the estimation technique. In section 4, we present the discussion of the results of the proposed model. Section 5 contains the concluding comments.

2. Brief Empirical Review

This article seeks to examine the relationship between human capital accumulation and economic growth in Nigeria. The endogenous growth theory provides us with the transmission mechanism between human capital accumulation and economic growth. Romer (1986) and Lucas (1988), in particular, eulogize the prominence of this body of theory. On the one hand, the former challenged the thesis of early classical economists on the prospect for growth. On the other hand, the latter challenged the assumption of similar technology among economies.

In short, they argue that human accumulation, among other factors, is the most important source of economic growth. According to Romer (1986, 1990), the most important factor of an endogenous growth is not the large number of people; rather, it is the quality of the people, which is the human capital. An economy with a large stock of human capital will prosper and grow faster.

Lucas (1988) refines this and also asserts that endogenous growth emanates from the external effects of human capital. Investments in human capital (and not physical capital) induce positive externalities. This spillover effect impacts the level of existing technology positively. This, in turn, stimulates endogenous growth. Hence, the changes in human capital contribute to productivity growth and welfare.

Based on the theoretical postulations of Romer (1986, 1990) and Lucas (1988), this article defines economic growth as a function of human capital, physical capital and other factors, such as financial development and trade openness.

2.1 Human Capital

Human capital is embodied in humans (i.e. labour). It has a positive external effect on the production possibility frontiers of firms. Although it exhibits diminishing returns, new knowledge generated contributes to production efficiency. Thus, a wide spread of human capital among individuals in the society breeds larger accumulation of human capital (Galor & Moav, 2004). This, in turn, boosts economic growth.

Wang and Yao (2003) examined the sources of economic growth in China for the period 1952 to 1999. Their findings reveal that the investment in human capital has a significant impact on productivity and welfare. Baldacci et al (2008) find a positive relationship between human capital (measured as changes in education capital) and economic growth. For Dias and Tebaldi (2012), while human capital accumulation significantly affects growth in the long run, it takes time for the increase in human capital to affect growth. Hence, we propose that a positive relationship exists between human capital and economic growth in Nigeria.

2.2 Physical Capital

Physical capital also has an impact on economic growth. For instance, Wang and Yao (2003) are of the view that the accumulation of physical capital remains the most important source of output growth. Galor and Moav (2004) have a contrary opinion. They argue that physical capital accumulation breeds inequality in the process of development. However, they are of the view that physical capital and human capital accumulation are fundamentally asymmetric. In support of this, Dearmon and Grier (2011) argue that physical and human capital is simultaneously determined.

The AK model assumes constant returns to reproducible capital and emphasizes that physical capital positively impacts growth in the long run. Testing this model empirically, Rogers (2003) concludes that economic growth rises with the imbalance between physical capital and human capital. Recently, Romeo-Avila (2013) applies Jone's test for the empirical validation of the AK-type model

to the Chinese economy. The findings support the leading role of the physical capital accumulation in China's economic growth.

2.3 Other Determinants

In explicit terms, Romer (1986, 1990) and Lucas (1988) did not discuss the role of institutions (whether trade, finance, or politics) in their growth models. However, their general framework offers allowance for the inclusion of how these institutions impact economic growth. For instance, Galor and Moav (2004) assert that as income increases, credit constraints gradually diminish, as well as the differences in saving rate. This breeds inequality but its impact on economic growth becomes insignificant. This emphasizes the role of financial development on economic growth.

When the domestic economy interacts with the foreign economy, there will be international capital flows. This diminishes the role of inequality in stimulating physical capital accumulation. Consequently, the adoption of skill-biased technologies is promoted. This, in turn, increases the return to human capital and eventually boosts economic growth. In other words, trade openness has impact on economic growth.

3. Empirical model and estimation

3.1 Model Specification

In this section, we follow the methods used in Oketch (2006) for three reasons, which we consider very important for this paper. First, the models have been tested and proved quite useful in explaining the relationship between human capital formation and economic growth in Africa by previous studies (for instance, McMahon, 1987; Grier, 2005). Second, the models are built on the assumption that both human and physical capitals are endogenously determined. The third reason encapsulates the model specification itself.

The model, which expresses economic growth as a function of human capital and physical capital, is first estimated as an independent ordinary least squares (OLS) single equation, and jointly, as one of three simultaneous structural equation. We have only considered the three structural equations. Interested readers may see Oketch (2006: 559) for a detail of how the equations are derived. These equations are as follows;

$$(y - n) = \beta_1 + \beta_2 \left(\frac{I_k}{Y} \right) + \beta_3 \left(\frac{I_H}{Y} \right) + \alpha_1 n + \alpha_2 l + \alpha_3 D_1 \quad (1)$$

$$\left(\frac{I_k}{Y} \right) = \beta_4 + \beta_5 (y - n) + \beta_6 \left(\frac{I_H}{Y} \right) + \alpha_4 n + \alpha_5 \quad (2)$$

$$\left(\frac{I_H}{Y} \right) = \beta_7 + \beta_8 (y - n)_{-1} + \alpha_6 n + \alpha_7 l \quad (3)$$

Where $(y-n)$ defines the real per capita GDP growth rate; (I_k/Y) defines the gross private domestic investment in physical capital; (I_H/Y) defines the investment in basic and advanced education; n defines the average population growth rate; l defines the average growth rate in labour force; while D_1 is a dummy variable, which takes into consideration some of the economic and natural challenges confronting Africa as a continent.

In order to establish the impact of human capital formation on economic growth in Nigeria, the study uses a multiple regression model, which is specified below:

$$y = \beta_1 + \beta_2 \left(\frac{I_k}{Y} \right) + \beta_3 \left(\frac{I_H}{Y} \right) + \beta_4 Z_i + \alpha_1 n + \alpha_2 l + \alpha_3 D_1 \quad (4)$$

where y defines per capita real GDP, and Z_i defines the control variables, such as trade openness and financial sector development. These variables also have the potential of stimulating economic growth in the country. From equation 4 above, we have the following;

$$\begin{aligned} (I_k/Y) = & \beta_5 + \beta_6 y + \beta_7 (I_H/Y) + \alpha_4 n \\ & + \alpha_5 l \end{aligned} \quad (5)$$

$$\begin{aligned} (I_H/Y) = & \beta_8 + \beta_9 y_{-1} + \beta_{10} (Exp_h/Y) + \alpha_6 n \\ & + \alpha_7 l \end{aligned} \quad (6)$$

Where y_{-1} defines the lagged per capita real GDP, and (Exp_h/Y) defines the government spending on health (in percentage of the GDP). This is based on the assumption that the quality of health services has an impact on human capital investment as well. Equations 4 to 6 can best be described as structural. And any attempt to estimate the parameters using the ordinary least squares (OLS) technique may yield biased estimates.

To avert this problem, this study uses the multiple regression model (Equation 7) used in Oketch (2006). The model expresses the per capita GDP growth as a function of both investment in gross private domestic physical capital and human capital, measured as percentage of GDP. However, this study takes into consideration some of the peculiarities of the Nigerian economy. This necessitated the inclusion of additional variables such as trade openness, financial development, and two dummy variables. The first dummy variable takes care of the changes in the economic structure of Nigeria, while the other takes care of the changing political system in the country.

$$\begin{aligned} y_t = & \beta_1 + \beta_2 (I_k/Y)_t + \beta_3 (I_H/Y)_t + \beta_4 TO_t + \beta_5 FD_t + \alpha_1 n + \alpha_2 D_1 + \alpha_3 D_2 \\ & + \varepsilon_i \end{aligned} \quad (7)$$

The details of the variables included in the models above are clearly displayed in Table 2.

Table 2: Definitions of variables included in the model

Abbreviations	Description
y	per capital real GDP growth rate
I _H /Y	Government spending on Education (in percentage of GDP)
I _G /Y	Gross capital formation (in percentage of GDP)
n	Population growth rate
TO	Trade Openness [i.e. exports plus imports; divided by GDP]
FD	Financial Development [i.e. broad money supply divided by GDP]
D ₁	Economic system dummy [i.e. 1 for period before SAP; 0 for otherwise]
D ₂	Political system dummy [i.e. 1 for democratic eras; 0 for military eras]

3.2 Data and sources of data

Time series data were collected for the purpose of measuring the contribution of human capital to economic growth

in Nigeria. The sample analyzed in this study spans the period 1981 to 2010 and consists of 30 observations. The population figures and the per capita real GDP figures were collected from Economic Watch data bank, while the remaining data (government spending on education, gross capital formation, import and export values, and financial deepening) were all sourced from the Central Bank of Nigeria (CBN) Annual Statistical Bulletin for the year 2010. Table 3 provides a summary of these data.

Table 3: Descriptive statistics of key variables

Variables	Observations	Mean	Median	Std. Dev.	Minimum	Maximum
per capital GDP growth rate	30	1.614	2.500	6.938	-13.280	17.930
Government spending on Education (in percentage of GDP)	30	8.410	3.585	9.332	0.060	25.980
Gross capital formation (in percentage of GDP)	30	14.087	12.375	9.529	1.790	49.610
Government spending on Health (in percentage of GDP)	30	4.353	1.200	5.509	0.020	16.810
Trade Openness	30	60.626	57.905	13.474	45.336	107.980
Financial Development	30	24.951	24.170	7.040	12.800	38.140
Population growth rate	30	2.786	2.753	0.068	2.702	2.944
Economic system dummy	30	0.172	0.000	0.384	0.000	1.000
Political system dummy	30	0.517	1.000	0.509	0.000	1.000

4. Empirical analysis of results

4.1 Discussion of results

The main results are based on the model given in Equation (7). In an

attempt to estimate this equation, first, we conducted a correlation analysis for the explanatory variables. The findings are reported in Table 4. The analysis of this correlation matrix indicates that few of the observed relationships were very strong. In fact, the strongest relationship was between government spending on education and health ($r = 0.970$). The positive correlation coefficient implies that the relationship between government spending on education and health is strong and direct. Gross capital formation and trade openness also exhibit a similar relationship ($r = 0.669$).

Table 4: Correlation matrix

	EGDP	HGDP	CGDP	FD	TO	PGR
EGDP	1.000					
HGDP	0.970	1.000				
CGDP	-0.426	-0.380	1.000			
FD	0.080	0.219	0.383	1.000		
TO	0.142	0.186	0.669	0.373	1.000	
PGR	-0.432	-0.395	0.055	0.019	-0.135	1.000

One important fact that is revealed from the analysis above is the need for utmost care while estimating the regression model presented by Equation 7. A simple rule of thumb emphasizes that when explanatory variables are correlated, the onus of multicollinearity is to render the OLS estimates biased. In other words, the estimated regression parameters can be severely affected. Consequently, we have attempted to minimize the effects, which the correlated variables may pose on the estimated parameters. Instead, we run a sequence of regressions omitting one of each of the variables that have

exhibited high correlations. The results of the four regression models that we have estimated are presented in Table 5.

The first model expresses the per capita GDP growth rate as a function of six explanatory variables, which include the two dummy variables. In this model, the overall government spending, expressed as a percentage of the GDP, was omitted as discussed above. In the same vein, we omitted trade openness. Among these explanatory variables, the results reveal that the four variables are statistically significant. Among these variables, government spending on education ($p = 0.005$) is statistically significant at 99 percent confidence level, while financial development ($p = 0.015$), population growth rate ($p = 0.032$), and economic system ($p = 0.044$) are statistically significant at 95 percent confidence level. Besides financial development, which impacts negatively on economic growth, the other three variables have a direct impact on economic growth. In addition, the effect of population growth is the greatest. Next to it is the economic system.

Table 5: Summary of regression results

Variable	(I)	(II)	(III)	(IV)
Government spending on Education (in percentage of GDP)	0.807 (3.091)*	—	0.695 (2.768)**	—
Gross capital formation (in percentage of GDP)	0.113 (0.610)	0.106 (0.582)	—	—
Government spending on Health (in percentage of GDP)	—	1.382 (3.197)*	—	1.199 (2.826)**
Trade Openness	—	—	0.115 (1.109)	0.102 (0.982)
Financial Development	-0.555 (-2.637)**	-0.727 (-3.040)*	-0.532 (-2.601)**	-0.681 (-2.919)*
Population growth rate	48.388 (2.282)**	47.947 (2.294)**	45.018 (2.130)**	44.985 (2.147)**
Economic system dummy	12.073 (2.135)**	12.781 (2.250)**	10.742 (1.910)**	11.519 (2.001)**
Political system dummy	-1.793 (-0.469)	-1.223 (-0.339)	-1.634 (-0.455)	-1.067 (-0.312)
Constant	-128.624	-122.660	-124.080	-119.319
R-squared	0.435	0.446	0.455	0.461
Adjusted R-squared	0.288	0.302	0.313	0.320
F-statistic	2.952	3.090	3.201	3.276
Akaike info criterion	6.549	6.529	6.513	6.503
Schwarz criterion	6.876	6.856	6.840	6.830

Note: *i.* the *t*-statistics of the estimated parameters are shown in parenthesis, *ii.* (*) Estimated parameter is statistically significant at 99 percent confidence level, *iii.* (**) Estimated parameter is statistically significant at 95 percent confidence level, and *iv.* (***) Estimated parameter is statistically significant at 90 percent confidence level

growth rate, economic, and political regime. Interestingly, government spending on health ($p = 0.004$) and financial development ($p = 0.006$) are statically significant at 99 percent confidence level, while, population growth rate ($p = 0.031$) and economic system ($p = 0.034$) are statistically significant at 95 percent confidence level. In the same way, the effects of the population growth rate and economic system are the most in terms of magnitude, but government spending on health is the most significant among these variables.

The third model expresses the per capita GDP growth rate as a function of government spending on education (in percentage of the GDP), financial development, trade openness, population growth rate, economic system, and political regime. The result from this estimated regression model is similar to the results of the first regression model, except that there is a slight change in the level of significance of two variables among these explanatory variables. These include; government spending on education ($p = 0.011$), which is now statistically significant at 95 percent confidence level, and economic system ($p = 0.069$), which is now statistically significant at 90 percent confidence level. In addition, the result shows that even though trade openness has a positive impact on economic growth, it is neither statistically significant at 95 percent confidence level nor at 99 percent confidence level.

The result of the final estimated regression model is also not different from the second estimated regression model, except for the change in the significance level of government spending on health ($p = 0.010$). In this case, it is statistically significant at 95 percent confidence level. Interestingly, the significance of economic system ($p = 0.057$) also changed. In this case, it is statistically significant at 90 percent confidence level. However, other variables, such as financial development ($p = 0.008$) and population growth rate ($p = 0.043$) maintained their statistical significance at 99 percent and 95 percent confidence levels, respectively.

The coefficient of determination, which seeks to explain the extent to which the explanatory variables explain the changes in the explained variable, for the estimated regression models are quite close. These range between 43.5 percent and 46.1 percent. In other words, the explanatory variables included in these models explain at least 43.5 percent, and at most 46.1 percent, of the changes in the explained variable. This, further, implies that a minimum of 53.9 percent and maximum of 56.5 percent of the changes in economic growth can be ascribed to variables that were included in the estimated model.

We have also used the F-statistics in order to ascertain the statistical significance of the joint influence of the explanatory variables on the explained variable, economic growth. A simple rule of thumb emphasizes that a big F, with a small *p-value*, means that the null hypothesis of no general relationship between the dependent and independent variables is discredited. From the results, the F-statistics range between 2.95 ($p=0.028$) and 3.276 ($p=0.018$). Interestingly, the value of the F-statistics increases as we adjust the regression models from the first through to the fourth. The findings, however,

The second model expresses the per capita GDP growth rate as a function of government spending on health (in percentage of the GDP), gross capital formation, financial development, population

reveal that, at 95 percent confidence level, the joint influences of the explanatory variables included in the four regression models are statistically significant.

So far, we have interpreted the results presented in Table 5. However, we have a little challenge here. We need to identify the best among these estimated models. We relied on a scientific approach of model selection, the *Akaike Info Criterion* (AIC). A min (AIC) strategy emphasizes that the model for which AIC_{\min} is the smallest represents the “best” approximation to the true model. Although we are aware that in practice, the model satisfying the min (AIC) criterion may not actually be a true model, we are, however, constrained because there is no way of determining the “true” model among the models. Even though the findings reveal that the AIC value declines from the first estimated regression ($AIC=6.549$) through the fourth model ($AIC=6.503$), a close look at the signs and magnitude of the estimated parameters shows that the four estimated regression models are quite similar.

4.2 *Policy implication of the results*

The results from Table 5 above are quite revealing. First, they show that government spending on education as a percentage of GDP impacts positively on the per capita GDP growth rate. In other words, a percentage increase in government spending improves the per capita GDP growth rate by at least 69.5 percent and at most 80.7 percent. The impact of the government spending on health proves to be more influential with a direct effect on the per capita GDP growth rate. The results show that a percentage increase in the government spending on health promotes at least 119.9 percent and at most 138.2 percent increase in the per capita GDP growth rate.

The explanations above demonstrate the significance of government support for both education and health with a view to stimulating economic growth and development. This conforms to the findings of Baldacci, et al (2008) who argue that education and health spending have a significant and positive impact on accumulation of education and health capital. Our result also conforms to Oketch (2006), whose findings reveal that the relationship between investment in basic and advanced education as a percentage of GDP and per capita growth is positive and significant. However, unlike both government spending on education and health, gross capital formation as a percentage of GDP and trade openness have a positive but insignificant impact on the per capita GDP growth.

Financial development impacts negatively and significantly on the per capita GDP growth. This conforms to De Gregorio (1996), who establishes the implication of borrowing constraints in an endogenous growth model. More importantly, the study reveals that the indirect effect of financial development on the endogenous growth model is a reflection of the effect of borrowing constraints on economic growth, which comes through their impact on human capital. Borrowing constraints have the potential of adversely affecting savings, and eventually, growth. In essence, the impact of borrowing constraints cannot be overlooked should the people of Nigeria desire to boost economic growth using the financial system related policies.

The dummy for the economic system exerts a positive and significant impact on the per capita GDP growth. The estimated coefficient of 11.519 implies that the period prior to SAP had more impact on economic growth in Nigeria. In other words, the impact of the economic system on economic growth was 11.519 higher during the pre-SAP era than the post-SAP era. This is a reflection of the economic institutions in Nigeria, which comprise the Ministries, and various government agencies saddled with the responsibility of implementing government-approved economic goals and objectives. These constitute structural institutions as defined by Dias and Tebaldi (2012). They support the hypothesis that structural institutions positively affect long-term economic performance, which propels the growth of physical and human capital instead of levels. These, in turn, determine long-run economic growth.

Finally, the results show that the dummy for political system is statistically insignificant, even though it exerts a negative impact on economic growth. This conforms to Dias and Tebaldi’s (2012) postulation that political institutions are not correlated with productivity and economic growth. Besides this, the estimated coefficient show that the democratic era has less impact on economic growth, which is 1.067 points lower than the military era. Does this mean that the military era was better in promoting human capital accumulation? In an earlier study, Helliwell (1994) raised the question regarding the economic requisite for democracy. The findings from this empirical study show that the impact of democracy on economic growth is mixed.

Helliwell (1994) asserts that democracy will not hinder economic growth provided the indirect positive influences flowing through investment and education surpass its potential negative effects.

This, accordingly, will promote economic growth. This, indeed, attests to the fact that the adoption of democracy does not translate automatically into economic growth. Instead, the government's commitment to the continuous improvement in the living standards of the people is a requisite. Hence, economic growth will be an achievable goal.

5. Conclusion

This paper has established the relationship between human capital accumulation and economic growth in Nigeria. The study reveals that government spending on health and education as determinants of human capital accumulation is statistically significant and both variables exert a positive impact on economic growth in Nigeria. Besides these, two key revelations are worth mentioning.

The first is the insignificant role of both gross capital formation and trade openness. Although both variables exhibit a high correlation, the importance of the gross capital formation, most especially, cannot be over-emphasized, even though Caballe and Santos (1993) emphasized that economies with high ratios of physical capital to human capital will always decumulate physical capital, while economies with low ratios of physical to human capital will always increase their holdings of physical capital (p.1064). This, of course, implies that the Federal Government of Nigeria needs to be more committed to the provision of infrastructural facilities, most especially, for the purpose of improving the quality of its human capital.

The second is the strong significance and positive impact exhibited by the population growth rate. Unfortunately, this study did not consider any of the SERs measure, which would have elicited the quality of the stock of capital inherent in the Nigerian economy. An increase in the growth of the population, without a corresponding growth in the quality of the stock of human capital is considered to be a deficiency by Gemmell (1996), who posits that an improved stock of human capital promotes larger investment in physical capital. In addition, an improved stock of human resources has the potential to imitate new technology, build scientific knowledge, adopt technological innovation, and create new products. Hence, they are more productive.

This study is, however, not void of shortcomings. An important area of extension of the study would be to expand the measure of the human capital accumulation beyond total expenditure on education and health, as percentages of the nation's GDP. In other words, future studies may incorporate the SERs measures, along with investments in education and health in order to establish the impact of human capital accumulation on economic growth. This will also create more opportunities for comparison between these two sets of measures.

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