

Human Capital Investment and Economic Growth in Nigeria: A Long-Run Path

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Abstract: Human capital investment has been seen as impetus to sustainable economic growth and this has necessitated the increase in government spending by major economies including Nigeria in order to achieve a steady long-run growth path and meet up with the Millennium development goal target. On this basis, the effect of human capital investment on economic growth in Nigeria between a decade after independence (1970) and 2009 is examined based on the endogenous growth theory framework. Following the underlying assumptions of the Endogenous Growth Model, real output is regressed on private capital investment, government human capital investment, human capital consumption and openness to trade. The time series of the variables were examined using the Augmented Dickey-Fuller unit root test and all of the series were found non-stationary at levels excluding population growth of economic active. Engle-Granger Cointegration test result revealed that there is long-run growth path between human capital investment and economic growth in Nigeria. However, the result of the cointegrating regression indicated that capital investment from the private and public sector and human capital consumption tends to be important factors that enhance real economic growth in Nigeria. While growth of economic active population and economic openness exert negative influence on economic growth in Nigeria.

Key words: Human capital investment, private capital investment, government spending, economic growth, long-run path

INTRODUCTION

The definition of a nation's wealth has widened to accommodate not only physical capital but also human capital as an independent factor of production required to achieve high and sustainable labour productivity rates. However, in recognition of this relationship, developing nations have in varying degrees attempted to stimulate the accumulation of human capital through spending on health and education. Okojie (2003) argued that no country has achieved sustained economic development without substantial investment in human capital. The effect of government spending on human capital development is still an unresolved issue theoretically as well as empirically. The concept of human capital refers to the abilities and skills of human resources of a country while human capital formation refers to the process of acquiring and increasing the number of people who have the skills, education and experience that are critical for economic growth and development of a country.

There have been increase attentions in recent time directed to the use of health and education as welfare indicators in addition to GDP per capita. Education, good health and longevity are intrinsically valuable inputs for

productivity. In conventional measures of productivity, health and education contribution are measured essentially by the costs of producing the outcomes, i.e., expenditure on schools and medical facilities. Such procedure identifies inputs rather than outputs, health and education cannot be directly purchased like materials goods and services. Health and education are often subsidized by the state. In some countries, education is compulsory for certain minimum length of times. Many countries if not most health and education services are produced by the public sector. Government plays direct part in providing services that are directly linked to human welfare through its numerous spending.

Over several decades in the past, government in Nigeria have allocated large sums of money for spending on the social sector yet the results on ground have been quite disappointing. Developing countries across the globe face a myriad of problems ranging from poor governance, poor programme implementation to corruption just to mention a few. The resultant effect of this is manifested in rising poverty levels, food insecurity, deplorable state of infrastructural facilities and a general poor service delivery system. Nigeria, the most populous country in sub-Sahara Africa is blessed with enormous

human material resources. Yet, poverty as at 1996 was 65.6% while the human poverty index stood at 41.6% (World Bank, 1996). From the foregoing, strong evidence to support that public consumption and investment spending are impetus for human capital development in major economies of the world. This has however, prompted the Nigerian government to channel large amount of funds annually towards the provision of education and health facilities despite increase in the level of youth unemployment, low productivity, deteriorating human welfare and numerous social vices. On this basis can this study investigate the long-run effect of human capital investment on economic growth in Nigeria between 1970 and 2009.

Empirical review: The literature on the link between human capital investment (education and health) and economic growth is filled with inconclusive findings from plethora of empirical studies. A few studies reported positive and significant relationship between growth and human capital investment while several others found significantly negative or no relationship between an increase in government spending and human capital productivity. Some of the studies include, in particular, Ram (1986) using a sample of 115 countries found government expenditure to have significant positive externality effects on growth particularly in the Developing Countries (LDCs) sample but total government spending had a negative effect on growth.

Also, Buffie (1999) in a cross country investigated the repercussions of reducing human capital expenditure in his model, he distinguished between skilled and unskilled labour in manufacturing sector. His major concentrating was on the public sector contribution to skill formation with the assumption that skilled labour growth is governed entirely by human capital investment of the government. Consequently, the stock of skilled labour is fixed in the short-run and rises or falls over time depending on whether the public investment is positive or negative. The finding shows that the investment on human capital formation leads to capital accumulations on a broad front.

Government human capital spending has a negative impact on growth (Grier and Tullock, 2001), Knack and Keefer (2000) and Tanninen (2001) studies using a sample of only advanced (mostly OECD) countries obtain similar results. For instance, Folster and Henrekson (2001) find that government consumption spending is growth-retarding but spending on education impacts positively on growth. Kneller *et al.* (1999) find that productive spending has a positive while non

productive spending has a negative impact on growth of OECD countries (1970-95). Earlier, Lin (1994) used a sample of 62 countries (1960-99) and found that non-productive spending had no effect on growth in the advanced countries but a positive impact in LDCs.

Yildirim and Sezgin investigate the spending on health and education expenditure during the Turkish republican era. The study cover the period from 1924-1996. They conclude that there is a competition between education and health expenditure in the budgeting process. Also, Dabelko and McCormick (2003) examined the impact of changes in military spending on spending levels for public health in a number of countries for selected years from 1950-1972. Their major findings are that opportunity cost does exist for education and health across all nations and all years but they are weak in magnitude then levels of economic development have little or no impact upon the opportunity cost for these policy areas.

Narayan (2006) in his study reported that empirical exercises on the effect of government spending which distinguish between government consumption and government capital accumulation suggest that government capital stock has a positive impact on productivity growth and that government spending had a positive and highly significant impact on output growth rates. An increase in current expenditure has positive and statistically significant growth effects while a negative relationship detected between the capital components of public expenditure and per capita growth.

However, one of the recent leading studies on the effect of public expenditure components on growth in Nigeria is the study of Adesoye *et al.* (2010) who examined the link between government spending and economic growth in Nigeria between 1977 and 2006 based on the Ram (1986) Model. They developed three variants of Ram (1986) Model regressing real GDP on private investment, human capital investment, government investment and consumption spending at absolute levels, regressing it as a share of real output and regressing the growth rate real output to the explanatory variable as share of real GDP in other to capture the precise link between public investment spending and economic growth in Nigeria based on different levels. Their empirical result showed that private and public investments have insignificant effect on economic growth during the period under review and they establish long-run relationship between public expenditure and economic growth.

Theoretical framework and model specification: The Endogenous Growth Model also known as the Neo-Classical Growth Model or new growth theory or

Solow-Swan Growth Model is a term used to sum up the contributions of various researchers to a model of long-run economic growth within the framework of neoclassical economics. The Neo-Classical Model was an extension to the 1946 Harrod-Domar Model that included a new term, productivity growth. It was developed in the 1980s as a response to criticism of the Neo-Classical Growth Model. The Endogenous Growth Theory holds that policy measures can have an impact on the long-run growth rate of an economy. For example, subsidies on research and development or education increase the growth rate in some endogenous growth models by increasing the incentive to innovate.

Endogenous Growth Theory means economic growth from within a system usually a nation state. Problems identified in this model are that growth in per capita output converges to zero in the steady state and that there is a positive correlation across countries between investment rates and growth. But in the Solow Model, this will affect the long-run level of output but not growth rate. This theory offers hope to the Newly Industrialized Countries (NICs) and alternative ways to develop without being dependent on trade. Traditional theories of trade focus on trade as an engine of growth. The Endogenous Theory focuses on education, on the job training and development of new technologies for the world market and this account for its increasing relevance. In the traditional neoclassical models, growth originates from trade. What endogenous theory does is to show how countries can work with the process of globalization to find complementary activities (like education and retraining) and regulatory frameworks which help them survive and collect rent from multinational corporations within their political and economic boundaries. However, Romer (1990) stressed that endogenous growth does not just happen. He identified four basic pre-conditions for growth which are:

- Capital: measured in units of consumption goods
- Labour: skills available from a healthy human body
- Human capital: activities such as formal education and on the job training which is person specific
- An index of the level of technology

A glaring problem here is that the empirical implications of these models are less clear as technological progress and the factors influencing it are difficult to measure.

However, unlike number of earlier studies the endogenous growth framework is adopted as the theoretical framework for modelling the effect of human capital investment on economic growth in Nigeria. It is

conventional to begin with the production function which factors inputs (labour and capital) enter the model multiplicatively as:

$$Y = f(L, K) \tag{1}$$

$$Y = AL^{\alpha}K^{\beta} \tag{2}$$

Where:

- Y = The aggregate real output
- A, L and K = Technological change, labour and capital, respectively

Following Adesoye *et al.* (2010), capital stock (K) comprises of capital investment from the private and public sector block. This is expressed as:

$$K = K_D + K_G \tag{3}$$

Where:

- K_D = The private capital investment
- K_G = The government human capital investment which is a set of capital expenditure on education and health as defined in Ram (1986)

Then, incorporating Eq. 3 into Eq. 2 gives Eq. 4 as:

$$Y = AL^{\alpha}(K_D + K_G)^{\beta} \tag{4}$$

Since, output growth determinants are not limited to technological changes, labour and capital stock, researchers incorporate human capital consumption (H_c) and Openness to trade (OP) as set of exogenous factors that endogenous derive real output growth within the Nigeria system. These factors are assumed to enter the Augmented Endogenous Growth Model multiplicatively as:

$$Y = AL^{\alpha} (K_D + K_G)^{\beta} (H_c)^{\delta} (OP)^{\lambda} \tag{5}$$

Following one of the underlying Endogenous Growth Theory assumptions, researchers assume constant return to scale growth and isolating labour to grow at a proportion of the growth of economic active population (between the age of 15 and 65) as:

$$\therefore \alpha + \beta + \delta + \lambda = 1, \frac{dL}{L} = n \tag{6}$$

Incorporating underlying transformation in Eq. 6 and in Eq. 5, taking the log of Eq. 5, technological change being constant and adding stochastic term, the empirical model for this study is expressed as:

$$\ln Y = c + \alpha n_t + \beta_1 \ln K_{Dt} + \beta_2 \ln K_{Gt} + \delta \ln H_{Ct} + \lambda \ln OP_t + u_t \quad (7)$$

where, α , β_1 , β_2 , δ , λ are elasticities parameters of output with respect to population growth, private capital investment, government capital investment, government human capital consumption, and openness to trade and positive signs are expected, respectively.

MATERIALS AND METHODS

The time series properties of the variables incorporated in Empirical Model (Eq. 7) is examined using the Augmented Dickey-Fuller unit root test in order to establish the long-run equilibrium of each of the series. The test involves the estimation of equations with drift and trends as proposed Dickey and Fuller. The test equations are expressed as:

$$\Delta Z_t = \eta_0 + \eta_1 Z_{t-1} + \sum_{i=1}^n \pi_i \Delta Z_{t-i} + v_t \quad (8)$$

$$\Delta Z_t = \eta_0 + \eta_1 Z_{t-1} + \eta_1 t + \sum_{i=1}^n \pi_i \Delta Z_{t-i} + v_t \quad (9)$$

The time series variable is represented by Z , t and v_t as time and residual, respectively. The Eq. 8 and 9 are the test model with intercept only and linear trend, respectively.

Also, to determine the long-run path of the effect of human capital investment on economic growth in Nigeria, the Engle-Granger two procedures cointegration test is employed. The first procedure involves generating residual or Error Correction Term (ECT) from the Eq. 10 express as:

$$ECT_t = u_t = \ln Y - (c + \alpha n_t + \beta_1 \ln K_{Dt} + \beta_2 \ln K_{Gt} + \delta \ln H_{Ct} + \lambda \ln OP_t) \quad (10)$$

The last procedure requires subjecting the Error Correction Term (ECT) to unit root test analysis with the null hypothesis no stationary at level. The rejection of this hypothesis in turn leads to the rejection of the null hypothesis no cointegration, i.e., no long-run convergence among the series.

Data source: The time series data on real output, private capital investment, government human capital investment, government human capital consumption, population growth of economic active and openness to trade are

sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin, December 2009 and the World Development Indicator (WDI) April, 2010.

RESULTS AND DISCUSSION

Unit root analysis: The stochastic process of the time series variables (real output, private capital investment, government human capital investment, government human capital consumption, population growth of economic active and openness to trade) employed for the analysis of the effect of human capital investment on economic growth in Nigeria between a decade after independence (1970) and 2009 is examined using the Augmented Dickey-Fuller (ADF) unit root test and the results is shown in Table 1.

A closer look at Table 1 shows that among entire incorporated time series variables, only the population growth of economic active (n) series is found to reject the null hypothesis unit root at level for ADF Test Model with intercept and trend. This implies that the series, population growth of economic active (n) stationary at level and converges to its true long-run equilibrium. Although, log of real output ($\ln Y$), private capital investment ($\ln KD$), government human capital investment ($\ln KG$), Human Capital consumption ($\ln HC$) and Openness to trade ($\ln OP$) series do not reject the null hypothesis no stationary at level but after taking their first difference, the series were found to be stationary at first difference. This implies that log of real output ($\ln Y$), private capital investment ($\ln KD$), government human capital investment ($\ln KG$), Human Capital consumption ($\ln HC$) and Openness to trade ($\ln OP$) series diverge from equilibrium at level and integrated of order one.

Cointegration test: However, Adesoye *et al.* (2010) emphasized that regressing stationary series on non-stationary time series might yield spurious regression and

Table 1: ADF unit root test results

Variables	ADF Tau statistics		Order of integration
	Intercept	Linear trend	
In Y	-5.7537*(0) [-3.6156]	-6.0581*(0) [-4.2191]	1
In KD	-5.2724*(0) [-3.6156]	-5.2025*(0) [-4.2191]	1
In KG	-7.1886*(0) [-3.6156]	-7.1022*(0) [-4.2191]	1
In HC	-7.8631*(0) [-3.6156]	-7.7414*(0) [-4.2191]	1
n	-5.0823*(1) [-3.6156]	-5.7666*(1) [-4.2191]	0
In OP	-6.0011*(0) [-3.6156]	-6.1561*(0) [-4.2191]	1

Significant at (*)-1% McKinnon critical value. The tau statistic are estimated using optimal lag length selected based on the minimum AIC and SIC. Values in bracket () and parenthesis [] are lag length and 1% test critical, respectively

Table 2: Engle-Granger Cointegration test result

Variable	ADF Tau statistics		Order of integration
	Intercept	Linear trend	
ECT	-4.4955*(0) [-3.6105]	-4.4566*(0) [-4.2119]	0

Significant at (*)-1%McKinnon critical value. The tau statistic are estimated using optimal lag length selected based on the minimum AIC and SIC. Values in bracket () and parenthesis [] are lag length and 1% test critical, respectively

deter long-run convergence among the series. In order to avert the problem of spurious regression and misspecification errors, the long-run linear combination of series are examined using the Engle-Granger two procedures cointegration test and the result is shown in Table 2.

The error correction term or residual series generated from the linear combination of the series based on the estimated regression model is subjected to unit root test as the last procedure. The Error Correction Term (ECT) series prosperities test result shown in Table 2 revealed that the ECT is stationary at level and integrated of order zero. This implies that the null hypothesis no cointegration is rejected at 1% McKinnon critical value. Researchers therefore infer that the linear combination of real output (lnY), private capital investment (lnKD), government human capital investment (lnKG), Human Capital consumption (lnHC) and Openness to trade (lnOP) series yield stationary (long-run equilibrium).

Long-run analysis: Since, the linear combination of the series incorporated in the regression model is stationary then the estimated regression explains the long-run relationship between human capital and economic growth in Nigeria. The result of the cointegrating regression shown in Table 3, expectedly revealed that private capital investment (lnKD), government human capital investment (lnKG) and Human Capital consumption (lnHC) exert positive effect on real output growth in Nigeria between 1970 and 2009. Although, the effects of government human capital investment and consumption were found partially and statistically significant at 5 and 10% acceptance level based on the reported t-statistic result.

Unexpectedly, population growth rate of the economic active (n) and degree of economic Openness (lnOP) were found to significantly deter the growth of economic output at 5% critical level. This implies that the majority of the economic active population are not productivity enough to enhance output growth and this is reflected in the continuous increase in youth unemployment rate, crime, social violence, inadequate education and health infrastructure for the growing population. Likewise, the reported result indicated that the gains from trade in terms of technological adoption and

Table 3: Estimated long-run regression

Variables	Coefficient	SE	t-statistic	Prob.
C	59.949950	5.602389	10.700780	0.0000
lnKD	0.136544	0.151527	0.901125	0.3739
lnKG	0.432482	0.108718	3.978006	0.0003
n	-0.976880	0.098145	-9.953416	0.0000
lnHC	0.188969	0.111319	1.697546	0.0987
lnOP	-0.696840	0.308762	-2.256883	0.0306

Dependent variable: lnY, Method: Least Squares, Sample: 1970 2009, Included observations: 40, R²: 0.932078, F-statistic: 93.31457, Adjusted R²: 0.922089, Prob.(F-statistic): 0.000000 and Durbin-Watson stat.: 1.410146

transfer and knowledge transfer have resulted to brain drain and consequently deteriorated economic growth in Nigeria during the review period.

From Table 3, the result of the adjusted R² revealed that 92.2% of the total variation in economic output is accounted by changes in real output (lnY), private capital investment (lnKD), government human capital investment (lnKG), Human Capital consumption (lnHC) and Openness to trade (lnOP) and this indicated strong goodness of fit of the employed data set. Likewise, the reported F-statistic result prompted the rejection of the null hypothesis no joint significance at 5% critical level. This implies that the incorporated human capital components from the private and public sector block and other incorporated exogenous factors have long-run simultaneous and significant effect on real output in Nigeria between 1970 and 2009.

Diagnosis test analysis: Advancement in econometric analysis have brought about the use of coefficient, residual and stability diagnostic test methods to ensure that empirical models are free of classical diseases, i.e., violation of classical assumptions underlying time series modelling. Even though earliest study in this areas failed to carried out diagnostic test to ensure structural stability of their empirical models. However, the result of the diagnostic test carried out on the estimated long-run regression model is shown in Table 4.

From Table 4, the result of centered variance inflation factor as a coefficient diagnostic test to determine the magnitude of the coefficient variance being inflated by multicollinearity reported low relative values for each of the explanatory variables and this indicated that there is no presence of strong multicollinearity in the estimated model. Also, researchers do not reject the null hypothesis of normal distribution based on the non-significance of the Jaque-Bera statistic and this shows that the generated residual from the estimated model is normal distributed. Further residual diagnostic tests indicated rejection of the null hypotheses no serial correlation and no hetroskedsticity for the Breusch-Godfrey Serial Correlation test and white hetroskedasticity test, respectively.

Table 4: Estimated regression diagnostic test

Variables	Coefficient variance	Uncentered VIF	Centered VIF	Variables	Coefficient variance	p-value	Centered VIF
Variance inflation factor				Normality test			
C	31.38676	7074.267	NA	Jarque-Bera	1.509677	Prob.	0.470087
lnKD	0.022960	533.3738	20.15079	Breusch-godfrey correlation LM test			
lnKG	0.011820	163.4636	16.28953	F-statistic	1.610103	Prob. F(2,32)	0.2156
n	0.009632	6016.358	1.939997	Obs x R ²	3.657225	Prob. $\chi^2(2)$	0.1606
lnHC	0.012392	195.1887	25.21713	White heteroskedasticity test			
lnOP	0.095334	343.0979	3.792338	F-statistic	1.796972	Prob. F(20,19)	0.1036
				Obs x R ²	26.16659	Prob. $\chi^2(20)$	0.1604
				Chow breakpoint test: 1986			
				F-statistic	8.907377	Prob. F(6,28)	0.000
				Log likelihood ratio	42.70857	Prob. $\chi^2(6)$	0.000
				Wald statistic	53.44426	Prob. $\chi^2(6)$	0.000

In ensuring the long-run structural stability of the estimated model, the Chow breakpoint test is employed to determine the effect of structural break. However, the effect of the adopted Structural Adjustment Programme (SAP) in 1986 is analyzed and the result of the Chow's test indicated the rejection of the null hypothesis no structural break in human capital investment due to SAP at 5% significance level. This implies that the adoption of the Structural Adjustment Programme (SAP) shifted the pattern of human capital investment and economic growth in Nigeria. As econometric literature suggest, this might require further test analysis which is outside the scope of this study.

CONCLUSION

The Endogenous Growth Model which this study anchored on as theoretical framework for modelling the effect of human capital investment on economic growth in Nigeria between 1970 and 2009 revealed a long-run convergence of the linear combination of the real output, private capital investment, government human capital investment, human capital consumption and openness to trade. The estimated long-run equilibrium model indicated that capital investment from the private and public sector and human capital consumption tends to be important factors that enhance real economic growth in Nigeria. While growth of economic active population and economic openness that have effected by growing unemployment and brain drain respectively, exert negative influence on economic growth in Nigeria during the reviewed period. Therefore, this study concludes that human capital investment has long-run effect on economic growth in Nigeria.

On the basis of the empirical findings this study proffers collaborative human capital investment between the private and public sector, increase in education and health infrastructure investment, transparency and accountability in human capital consumption spending, creation of youth development centre for vocational

training and other empowerment programmes, replacement of obsolete technological and facilitate trainings in home country by expatriate from abroad in order to enhance economic growth through human capital channel in Nigeria.

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