Economic Growth Experience of West African Region: Does Human Capital Matter?

Akanni Olayinka LAWANSON
Department of Economics
University of Ibadan
Ibadan, Nigeria

Abstract

This paper empirically investigates the relevance of educational and health components of human capital to economic growth, using a panel data from sixteen West African countries over the period 1980 to 2013. GDP per capita is linked to health and education capital while accounting for population growth, physical capital, trade openness, and other growth control variables. To correct for endogeneity and other estimation problems this paper employs Diff-GMM dynamic panel technique. Empirical findings indicate that coefficients of both education and health have positive statistically significant effects on GDP per capita. The paper affirms the strong relevance of human capital to economic growth of West Africa. It is recommended that increased resources and policy initiatives to motivate and enhance access to both health and education by the population should be pursued by policy makers.

Keywords: West Africa, Economic growth, human capital, education capital, health capital, GDP per capita, physical capital.

1. Introduction

Many African countries have in recent decades experienced steady growth performance of their economies, and there is an increasing global focus on the continent as the world new destination for investments. However, the limiting effect of the recent outbreak of Ebola virus disease in West Africa (WA) in 2014, and the associated restriction of the region's economic interaction with the rest of the world has brought to the forth the role of health and human capital in the economic growth process of the region. Apart from constituting a devastating depletion of the labour force, the productivity capacity was grossly hampered, with resources intended for other uses diverted to confront the outbreak and treat victims.

The Ebola crisis has resulted in job losses, rising food prices, and agricultural disruption, and have resulted in sharp drops in the use of health and education services, which are likely to increase poverty, child and maternal mortality, and facilitate the spread of HIV/AIDS and malaria, particularly for the rural poor (UNDP, 2014). Over the period for which the virus disease lasted, attention and focuses was shifted to the challenges it constitutes at the expense of other issues of national importance. All these had significant effects on economic activities, many of which still linger on. Apart from limiting business activities in the affected countries, resumption of education activities were delayed for a period of between about two months in Nigeria to nine months in Sierra Leone, which implies a possible future delay of entrance into the labour market. Besides the poor health status in the region, the Ebola incidence further expose the vulnerability of the region to health challenges and the weak medical research ability, this bothers on her relatively poor quality of education.

According to Lopez-Casasnovas, Costa-Font, & Planas (2005), a country is incapable of maintaining a state of continuous growth without a labour force with some minimum levels of education and health status. Apart from the lingering health and educational challenges of the region, this further buttresses the notion of the inadequacy of physical capital in fully accounting for variation in economic growth. The health and educational status of WA sub-region remain the least among the regions of the world, having the least economic fortune as well, despite the appreciable economic growth performance of many of the countries in the last one and half decades. Though investment and technological opportunities are crucial to the growth of economy, investment rate tends to increase due to effect of human capital, as the levels of education and health increase.

The more educated and healthier a workforce the easier they found it to create, uses, and adapts new technologies. As a developing region, with the abundance of labour resources and short supply of physical capital, enhancing healthy and educated labour force is crucial to the growth ambition of WA countries. Despite the revealed health vulnerability of WA countries ignited by the Ebola plague, and the knowledge (educational) gap to handle the situation, there is no study to the best of my knowledge that has examined the effect of health and education on growth collectively among the countries of the sub-region. Apart from Nigeria, there is dearth of studies that have been carried out to raise policy discussion on the effect of either education or health, or both on economic growth in individual countries of West Africa. Most of the existing studies have either independently considered the effect of education[1] or health[2] on economic growth for individual countries[3] in the sub-region, or include the countries as part of a broader sample of Sub-Saharan Africa (SSA) countries[4].

Therefore, this paper investigates the contribution of human capital to economic growth in WA and thus adds to studies in this area in the literature, and extends the link between human capital and economic growth to include health rather than the predominance of education human capital in the literature. The main scope of this study is to contribute to a deeper understanding of the human capital trends that characterize the West African health and education profile and to provide empirical evidence that measure their relevance to economic growth.

2. Trend in Health, Education and Growth in West African Region

The relative health status of the WA region is below other regions of the world. The region's health and education performances on the average remain generally below SSA average. However, the region has experienced consistent improvement in both education and health indicators, courtesy of the MDGs drive. Among several variables that has been used to proxy health development (a sustained improvement in the health status of the population), are life expectancy, infant, and under-five mortality rates. Also trend in health expenditure has been used as indicator of the resource flow to backup availability of inputs for production of health care services. Table 1 shows an improvement in all these variables for West African countries over the period 1980-2013.

For example, the life expectancy at birth in the region on the average rose by nearly 8 years over the same period. Infant mortality and under-five mortality rates on the average steadily fell from 117 and 209 deaths per thousand, respectively in the 1980s to about 102 and 178 in the 1990s, and further to 80 and 131, respectively in the first decade of the twenty-first century, while currently hover around 65 and 100 in the last four years. Associated with this progress is the steady increase in resources devoted to health care sector in the region.

As a proportion of GDP, the health expenditure on the average increased from 5.2% in the second half of the1990s to around 6.2% over period 2010-2013. Despite the observed progress in health status indicators, the quality of life in WA may not have been enriched equitably due to counteracting effects of disease burdens, especially the recent Ebola outbreak and the disorder it brought to the fabrics of the socioeconomic system of the region. Apart from expenditure on education, other indicators that have been used to track progress in the education human capital of countries include enrolment rates at primary, secondary and tertiary levels. Figures reported in Table 1, revealed significant progress for West African countries, as all the enrolment rate parameters improved over the period 1980 to 2013. Expenditure on education as a proportion of GDP in the region appears to have suffered initial setback in the last four decades.

The trend shows an initial drop from 4.26% in the 1980s to 3.6% in the 1990s, which slightly increased to 3.87% in the first decade of the twenty-first century, while it is slightly above the 1980s figure in the period 2010-2913.On the economic front, the region has over the last four decades experienced appreciable economic growth. Between the 1980 and 2013, the region GDP per capita almost tripled (Table 1), but remains lower than African average. While majority of the countries in the region have experienced consistent growth in the last two decades, only one (Cote d'Ivoire) is among the ten fastest growing economies in Africa. From an average of less than US$392 in the 1980s, the per capita GDP for the region increased to US$434 in 1990s.

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[1]Musbau & Rasak (2005); Ujunwa & Salami (2010); Naruden & Suman (2010), Ndiyo (2007); Lawal & Iyiola (2011); Dauda (2010).

[2] Rasaki (2011); Isola & Alani (2012); Ogungbensile, Olawumi & Obasuyi (2013); Onisanwa (2014); Bakare & Olubokun (2011); Babatunde (2014).

[3] Bakare (2006); Lawanson (2009); Adelakun (2011); Ogundari & Abdulai (2014); Jaiyeoba (2015).

[4] Gyimah-Brempong & Wilson (2004); Gyimah-Brempong et al. (2006)

It further increased to US$616 in the 2000s, and to US$1,076 over the period 2010-2013. This is reflected in the faster growth rate that characterized the last one and half decades in the region. Compared to between 1.8% and 2.8% growth rate experienced in the 1980s and 1990s, respectively, the region experienced a 4.8% average growth rate in the first decade of twenty-first century, while it increased to an average of 5% between 2010 and 2013. The growth trend of the region can be traced to the growth in capital formation and increased degree of openness of the region's economy to the rest of the world. The gross fixed capital formation (GFCF) in the region increased from 18% in the 1980s to over 26% in 2010-2013, after initial slight drop to 17% in the 1990s. Similarly, after a drop in the proportion of trade (export plus import) to GDP from 67.7% in the 1980s to 59% in the 1990s, it increased to over 70% in the 2000s, and further to an average of over 77% between 2010 and 2013.

3. Literature Review

Human capital is often considered as a knowledge-based economic concept, which explains why focus was initially on education. UN (1997) defines human capital as the productive wealth embodied in labour, skill and knowledge. It is represented by the aggregation of investment in activities, such as education, health, on-the-job training and migration that enhance an individual's productivity in the labour market (see Behrman & Taubman, 1982). It includes knowledge and skills acquired by labour, partly through education, and also their strength and vitality, which is dependent on their health (Khembo & Tchereni, 2013). Most cross-country studies associated human capital mostly with education (Bloom & Canning, 2005).

It has been argued that education and good health make individual more productive and thus contribute significantly to economic growth in general (Bloom, Canning, & Sevilla, 2004). Human capital as an economic term encompasses health, education and other capacities that can raise productivity (Todaro & Smith, 2003). The concept of human capital, which is traditionally associated with education, has in the last three decades been developed to include health factors. The joint inclusion of the two in growth regression model to avoid omitted variables bias problem has been justified on the premise that the two are not perfect substitute for the other (Aka & Dumont, 2008). Health and education are two closely related human (resource) capital components that work together to make the individual more productive (Jaiyeoba, 2015). Better health can reduce the depreciation of education capital, and thus increase the favourable effect of education on growth (Barro, 1996).

Human capital (education and health) improvements enhance economic growth but economic growth also contributes to higher levels of human capital through improvements in education and health conditions (see Adams, Hurd, McFadden, Merrill, & Ribeiro, 2003). There are multiple and complex channels through which health can affect growth, which are directly associated with the reversal causality effects between health, education, and growth. Education is viewed as vehicle for human capital accumulation and is to be treated as a factor of production besides labour and capital (Lucas, 1988). Thus education can enhance economic growth through technological catch-up especially in knowledge economy (Bloom et al., 2004).

Education plays a crucial role in individual and societal advancement and in providing the highly skilled human capital needed to create jobs, economic growth and prosperity (Pegkas & Tsamadias, 2014). Similarly, health as a resource permits people to lead an individually, socially and economically productive life (WHO, 1998; Anyanwu, Oyefusi, Oaikhena, & Dimowo, 1997). WHO (1998) further posited health as a positive concept emphasizing social and personal resources as well as physical capabilities. Furthermore, education has been shown to be integral to the process of delivering increased rates of economic growth and prosperity, and it has therefore been an important target area for public investment (Bredt & Sycz, 2007). It has been affirmed that the single most effective way to generate economic growth is to invest in human and intellectual capital to build a better education system (Gove, 2011).

Higher education institutions provide a platform for creating opportunities for firms to apply new technologies, as well as a forum for discussing new ideas, and in a knowledge-driven economy this is crucial (Mattoon, 2006). Education enhances productivity, not only through the knowledge or competencies incorporated in individuals, but also through the stimulation of physical investment and adoption of technological development (Sianesi & Reenen, 2003).Howitt (2005) identified five channels through which health human capital affects growth. The first is that individual's productivity and efficiency is conditional on health. Healthier workers have more physical and mental energy, being more creative and productive (see Schultz, 2005; Cai & Kalb, 2006). Better health increases workforce productivity by reducing incapacity, debility, and the number of days lost to sick leave, and increases the opportunity an individual has of obtaining paid work (Mayer-Foukes, 2001).

Second channels work through life expectancy, which makes investment in education more attractive, as well as serve as incentive to save more for retirement, since individuals expect to live longer (Kalemli-Ozcan, Ryder, & Weil, 2000). Healthier individuals have higher life expectancy and, as a consequence have great incentives to invest in improving skills since this investment will likely have a longer lasting impact (Thomas & Frankenbery, 2002). Higher life expectancy tends to stimulate economic growth by accelerating demographic transition and promoting investment in human capital development (Weil, 2001).

The third pathway is through learning capacity, as better cognitive capacities and educational outcomes are associated with improvement on health status and nutrition. The level of education and medical care available to household members are integral components of factors necessary to enhance economic growth in any society (Ogundari & Abdulai, 2014). Fourth is through creativity and innovation activities via enhanced educational achievement induced by health improvement. Innovation and technological progress are likely dependent on the educational level where health has an important role to play for achieving higher standards in these sectors (Pocas, 2012). Lastly is through correction of inequality, as wage differential is influenced by investment in human capital qualification. Reduction of income inequality will allow a higher proportion of individuals to finance their education and their health needs, being therefore more able to improve their economic situation (Howitt, 2005).

4. Methodology

4.1 Theoretical Model of Economic Growth Incorporating Human Capital

Following the extended traditional Solow-Swan growth framework as proposed by Mankiw, Romer & Weil (1992), and Barro (1991) we adopt growth regression approach, which allow for possible reconciliation of sustainable growth rate differences between countries. While the Solow model only predicts absolute convergence in special conditions, this model reflects the conditional convergence hypothesis. Assuming a Cobb-Douglas aggregate production function of the form:

$$Y_t = K_t^{\alpha} E_t^{\beta} H_t^{\theta} (A_t L_t)^{\mu} \dots \dots (1)$$

where $\mu = 1 - \alpha - \beta - \theta$, with $\alpha, \beta, \theta > 0$ and $0 < \mu < 1$. While Y denotes aggregate output, K is the stock of physical capital, E and H are stocks of human capital: education, and health, respectively. With labour augmented technology represented by A, AL represents effective labour.

With the model assumption that A and L grow at an exogenous and constant rate, “g” and “n”, respectively, the two terms are given as: $A_t = A_0 e^{gt}$ and $L_t = L_0 e^{nt}$. Taking the physical capital and human capital to be subject to the same constant depreciation rate δ, then $\dot{K} = sY - \delta K$, with “s” being marginal propensity to save. Expressing equation 1 in terms of effective labour units, it becomes:

$$y_t = k_t^{\alpha} e_t^{\beta} h_t^{\theta} \dots \dots (2)$$

Where $y = \frac{Y}{AL}$, $k = \frac{K}{AL}$, $e = \frac{E}{AL}$, and $h = \frac{H}{AL}$

The following equations of the steady state conditions of the productive factors serve as the premise upon which the dynamic evolution of the economy (growth rates) is determined:

$\dot{k}_t = s_k y_t - (n + g + \delta)k_t$: Physical human accumulation

$\dot{e}_t = s_e y_t - (n + g + \delta)e_t$: Education capital accumulation

$\dot{h}_t = s_h y_t - (n + g + \delta)h_t$: Health human accumulation

Incorporating the steady state conditions of the productive factors, and estimating a dynamic panel data model, where $(1 - e^{-\psi T})\ln A_0$ represents the country individual effects, the steady state output per unit of effective labour is determined as:

$$\ln\left[\frac{y_t}{y_{t-1}}\right] = \ln y_t - \ln y_{t-1} = \left(1 - e^{-\psi T}\right)\left[\ln A_0 + gt + \left(\frac{\alpha}{1-\alpha}\right)\ln s_k + \left(\frac{\beta}{1-\alpha}\right)\ln e^{*} + \left(\frac{\theta}{1-\alpha}\right)\ln(n + g + \delta) - \ln y_{t-1}\right] \dots \dots (3)$$

4.2. Empirical Model

Following Barro (1991) and Mankiv, Romer and Weil (1992) the study specify growth of GDP per capita $\dot{y}$ of country i as:

$$\dot{y}_{it} = f(y_{io}, k_{it}, e_{it}, h_{it}, z_{it}) \dots \dots (4)$$

where $\dot{y}_{it}$ represents the growth of output (GDP) in country i at time t, k_{it} denotes physical capital, e_{it} is a vector of education human capital, h_{it} is a vector of health human capital, and z_{it} is a vector of potential macroeconomic control variables such as population growth, trade openness, and inflation.

Explicitly, the empirical approach adopted for this study can be stated as linear regression of the economic growth as a function of human capital, physical capital, and other traditional control variables in growth model:

$$\dot{y}_{i,t} = \lambda_1 \dot{y}_{it-1} + \lambda_2 k_{it} + \lambda_3 e_{it} + \lambda_4 h_{it} + \lambda_5 Z_{it} + \mu_t \quad (5)$$

$$LGDPC_{it} = \tau_1 LGDPC_{it-1} + \tau_2 LGFCF_{it} + \tau_3 LPER_{it} + \tau_4 LSER_{it} + \tau_5 LTER_{IT} + \tau_6 LEE_{it} + \tau_7 LLE_{it} + \tau_8 LIMR_{it} + \tau_9 LU5MR_{it} + \tau_{10} LHE_{it} + \tau_{11} POP_{it} + \tau_{12} LTOP_{it} + \tau_{13} INF_{it} + \mu_i \quad (6)$$

The education human capital is measured by the enrolment rates at primary, secondary, and tertiary levels, as well as the expenditure on education as percentage of GDP. In addition to life expectancy, the study includes both infant mortality and under-five mortality rates as measures of health human capital. Apart from data on mortality being accurate, easily comparable and readily available across countries over several time points (WHO, 2009), it is commonly used indicator of the availability, utilization and effectiveness of health care because it offers an indication of health status of population through those most susceptible to deterioration (McDonald & Roberts, 2004). Health expenditure as percentage of GDP as a health indicator. Other tradition control variables in economic growth model included are gross fixed capital formation as measure of physical capital, population growth, trade openness, inflation, and. All the variables in the analysis were used in their logarithm form except population growth and inflation rate. This study employed annual time series data with an unbalanced panel data from 1980-2013 for the 16 West Africa[5] countries. All data were sourced from World Development Indicator (WDI).

4.3. Estimation issue and procedure

A number of estimation issues naturally arise in the econometric analysis of the relationship between health, education and growth. These include unobservable heterogeneity, measurement error, endogeneity of regressors, and omitted variables issues. Estimates from Ordinary Least Square (OLS) in the presence of endogeneity problem are considered to be biased and inconsistent estimates. Unlike linear regression, in the presence of unobserved heterogeneity, panel data techniques are more suitable, since they take into account structures across countries. The adoption of instrumental variable techniques constitutes a way out in avoiding endogeneity problem. Usually lags of the endogenous variables are considered as instrument. Instrumental variables allow parameters to be estimated consistently in models that include endogenous right-hand-side variables even in the presence of measurement error.

To correct for these problems, the dynamic Difference-Generalized Method of Moment (D-GMM) panel estimation technique is considered. D-GMM is not only consistent in short panels, but is also robust and possesses general applicability. It also allows for controlling of measurement errors and avoid problem of omitted variables like unobserved country-specific effects, making derived estimates non-bias, as country-specific effects are eliminated by first-difference transformation. According to Arellano and Bond (1999), GMM is able to overcome econometric problems such as cross-sectional dependence of countries and multiple correlations, which are prevalent in macro panel models. Further to guide against problem of omitted variable bias highlighted in Glewwe, Maiga & Zheng (2014), some relevant macroeconomic growth variables were included to control for structural differences across the countries.

5. *Analysis Results*

5.1. Regression Analysis Results

Table 2 presents the results of eleven different models of human capital (health and education) contribution to economic growth in West Africa for the dynamic panel estimation using difference-GMM. To guide against multicollinearity between education and health indicators, each indicator was separately included in different models.

[5]Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

In the first four models, each of the education indicators were included to capture their independent effects on economic growth, while the next four models contain the separate inclusion of the health indicators. While in model 9, the education indicators were collectively included, the health indicators were collectively included in model 10, and all the education and health measures were simultaneously included in model 11. Consistent with dynamic GMM model parameter estimates, the results for the presence of first-order auto correlation AR(1) and the absence of second-order auto correlation AR(2) in the residual of the model are reported as satisfactory. Guiding against model misspecification, the overall appropriateness of the instruments is ascertained with the reported Sargan/Hansen test. While absence of serial correlation in the disturbances is revealed by both the AR(1) and AR(2) order autocorrelation, appropriateness of the specification is supported by the Hansen test.

5.1.1. Contribution of Education to Economic Growth

As earlier mentioned, four different alternative measures of education (enrolment rates at primary, secondary, and tertiary levels), and education expenditure were considered in the paper. As a priori expected, the education elasticity of growth is positive in the region with respect to each of the four proxies, but not all coefficients are statistically significant. While coefficients of primary and secondary enrolment proxies are significant when independently included in the models, the coefficients of the other two: tertiary enrolment and education expenditure are statistically insignificant. However, the coefficients of tertiary enrolment and education expenditure measures turns out to be significant in model 11, but with wrong sign for education expenditure.

Interpreting the magnitude of the elasticity, the results specifically show that 1% increase in population's primary enrolment and secondary school enrolments would result in about 0.17-0.90%, and 0.11-0.21% increase in per capita GDP growth, respectively. The impact on growth is higher for primary enrolment than secondary enrolment. These results compare favourably with Artidi and Sala-i-Martin (2003) findings that primary school enrolment is the most robust variable with significant positive effect on economic growth. Further, the World Bank (2012) assertion that primary enrolment may be a reflection of the productivity-enhancing effect of recent increase in primary enrolment in developing countries appears to be supported by the results.

Education elasticity of growth proxy by expenditure on education is positive, but not significant in column 4 and 9. However, the coefficient turned out to be statistically significant in model 11, but with negative sign. These results support Ayara's (2003) finding that a negative insignificant relationship exist between expenditure on education and economic growth. The results imply that 1% increase in ratio of education expenditure to GDP would result in 0.37% decline in per capita GDP growth in West Africa. This result however contradicts the findings by Khembo & Tchereni (2013) and Dauda (2010) that suggest a positive significant relationship between expenditure on education and economic growth. The negative sign of the education expenditure coefficient may be a reflection of the fact that the immediate effect is a drain on the economy, while the benefit to productivity is delayed to the future.

5.1.2. Contribution of Health to Economic Growth

Four alternative measures of health are separately included and combined in different models. The coefficients of the life expectancy and mortality measures of health are correctly signed and significantly different from zero, but coefficient of health expenditure is statistically insignificant, though correctly signed. Nevertheless, coefficient of health expenditure became significant in models 10 and 11, but contrarily assumes negative sign. Other things being equal, the overall results show that a 1% increase in the region's population life expectancy would bring about between 0.64% and 1.1% increase in per capita GDP growth. This supports the expectation that higher life expectancy (improvement in population's health status) serve as incentive for people to invest more in education and healthcare and save more for old age, which positively stimulates growth.

Evidence of positive and significant effect of life expectancy coefficient on economic growth was also found in Bloom et al. (2004).At between 1% and 10% significance levels, the mortality rates have the predicted effect on economic growth revealing that reducing infant mortality or under-five mortality rates by 1% will results in an economic growth of 0.37-0.98% or 0.22%, respectively, other things being equal. Though these levels of mortalities relate to section of the population that are not part of the labour force, it however represents loss of potential future labour force capacity of the population. These health indicators however have impact on the economically active population in terms of productivity workdays loss by care givers and emotional drain on them.

This ultimately affects economic growth negatively. Improvement in the survival and health of young children may provide incentives for reduced fertility and may result in an increase in labour force participation, which may, in turn, result in increased per capita income. Poor child health is likely to lead to reduced physical work capacity when the children turn into adults (Spurr, 1983). Generally, the results here support findings in Bloom & Canning (2003) and Odior (2011) that a positive and significant relationship exist between expenditure on health and economic growth. The coefficient of health expenditure variable is only significant when included along with other education measures and/or health measures, but with negative sign. This implies that a 1% increase in health expenditure results in between 0.04% and 0.06% decline in economic growth. Conditional on efficient and judicious use of health resources, availability of additional resources can step up population productivity arising for increased access to healthcare. These results suggest possible inefficient use of health resources.

5.1.3. Effect of Macroeconomic Variables on Economic Growth

As expected, in all the regressions, the coefficient of the initial per capita GDP has a generally significant negative impact on economic growth, which supports the conditional convergence hypothesis. In line with a priori expectation, the coefficient of physical capital variable is significantly different from zero and positively impact economic growth in five of the models, except in models 5 to 7, where it is negative and insignificant, but not statistically significant in models 1 and 3.These results support the findings of larger study on SSA by Gyimah-Brempong & Wilson (2004) and Gyimah-Brempong, Paddison & Mitiku (2006), that positive relationship exist between investment share of GDP and economic growth.

The coefficients of population growth have negative sign in seven of the models, with exception of models 3, 6, 7, and 9, but only statistically significant in models 2, 8, and 10. As expected the increased openness of the region's trade to the rest of the world has positive effect on economic growth, but the coefficients of openness were found to be significantly different from zero in three of the models (2, 9, and 11). The results reveal that a 10% increase in openness would result in between 1.0% and 2.1% increase in per capita GDP growth. The inflation elasticity of economic growth is generally negative, and statistically significant in most of the models. Specifically, a 10% increase in inflation is capable of slowing down the growth of the economic by between 0.016% and 0.10%.

5.2. Discussion

The results of the regression models show that the education and health components proxies of human capital have the expected signs in influencing economic growth, except for the health and education expenditure measures, but of varying degree of significance. For health measures, life expectancy stands out to be the most relevant in influencing economic growth in West Africa region. This is not unconnected with the fact that life expectancy is a long standing measure of health status, and also incorporated mortality at birth, which is closely related to infant and under-five mortalities. Next in relevance are the infant mortality and under-five mortality measures. Infant mortality appears to be relatively more relevant to economic growth than under-five mortality. Health expenditure turned out to have the least relevance to economic growth in the region.

Generally, the relevance of health measures to economic growth is in line with the conventional thinking that as the health status of a nation improves, the people becomes more productive at work, spend more time in labour force, earn more, and save more which positively impact per capita GDP growth. Also, the results from this paper's analysis indicate that growth in educational capital proxies by primary and secondary school enrolment rates generally have positive and statistically significant impact on growth of per capita GDP. This is a pointer to the fact that the level of technical progress and labour productivity which positively affect economic growth are enhanced by increase in education. The relevant edge of primary school enrolment over other enrolment levels basically reflects low-income country characteristic of the region. Primary and secondary education are believed to be more beneficial to developing countries, while tertiary education benefits developed countries more (Petrakis & Stamatakis, 2002). Among the macroeconomic variables introduced into the models, the physical capital, inflation and openness standout to be relevant in influencing variable on economic growth of the region.

6. *Conclusion and Policy Implications*

The results from this paper reveal that both education and health components of human capital significantly influences economic growth in West Africa region. Also the proposition of human capital theory of education impacting economic growth via increase in productivity is supported by the results. However, results from this paper suggest that health has slightly stronger impact on the economy than education.

While three of the health indicators: lie expectancy, infant and under-five mortality measures are important in influencing growth, only two of the four education measures: primary, and secondary school enrolments consistently influence growth in all models estimated. While this outcome supports Weil's (2007) assertion that health's positive effects on GDP is strongest among developing countries, this contradicts Gyimah-Brempong and Wilson (2004) findings that education human capital contributes more to economic growth than health human capital.

As noted by Benos & Zotou (2015), that human capital contributes positively to economic growth in the literature, this study generally provides evidence of the positive relevance of human capital to economic growth in West Africa. From the policy perspective, the improvement in the health and education status of the region's population in the last two decades engineered by the MDGs should be maintained by greater commitment to the new sustainability development goals (SDGs). Despite the relative strength of health over education in affecting economic growth, resources and policy initiative to motivate and enhance access to both health and education by the population should be pursued. There is no doubt that both are relevant for economic growth of the region.

However, allocation of resources between the two sectors should take into account the differences in productivity. As a departure from the primary education focus of MDGs, further push for better enrolment at middle level education beyond primary is required to absorb most of the technology transfers into the region.

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Table 1: Trend in health, education and economic growth indicators (average for 16 West African Countries)

Variables	1980-1989	1990-1999	2000-2009	2010-2013
GDP per capita (US$)	391.53	433.72	616.12	1076.64
GDP Growth (%)	1.80	2.83	4.81	5.0
LE (years)	49.41	51.96	54.56	57.34
IMR (per 1,000 life birth)	117.43	102.62	80.12	64.84
U-5MR (per 1,000 life birth)	209.38	177.91	131.65	98.59
Health Expenditure (% of GDP)	NA	5.20	5.73	6.21
Primary Enrolment. Rate (%)	58.23	66.62	86.89	99.78
Secondary Enrolment. Rate (%)	16.05	19.09	32.68	45.10
Tertiary Enrolment. Rate (%)	1.92	2.69	5.33	8.85
Education Expenditure (%GDP)	4.26	3.61	3.87	4.35
GFCF (% GDP)	18.12	17.09	22.30	26.12
OPENNES	67.72	59.10	70.14	77.44

Sources: Computed from WDI 2015 data.

Table 2: Diff-GMM panel regressions results

	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6	MODEL 7	MODEL 8	MODEL 9	MODEL 10	MODEL 11
$LGDPC_{t-1}$	-0.8058*** (-26.86)	-0.8185*** (-18.79)	-0.7446*** (-17.05)	-0.8069*** (-16.51)	-0.9073*** (-38.54)	-0.8706*** (-34.79)	-0.8895*** (-36.06)	-0.9681* (-45.96)	-0.8961*** (-17.91)	-0.8861*** (-23.60)	-0.4119*** (-4.40)
LGFCF	0.0132 (0.54)	0.1014*** (2.68)	0.0220 (0.54)	0.0655* (1.89)	-0.0008 (-0.04)	-0.0177 (-0.80)	-0.0115 (-0.52)	0.0628*** (2.50)	-0.0760* (-1.68)	0.0218*** (3.57)	0.1293** (2.11)
LPER	0. 1698*** (4.10)								0.3330** (2.94)		0.8967*** (2.41)
LSEC		0.1132*** (1.92)							0.2081** (2.28)		0.2086 (1.13)
LTER			0.0488 (1.16)						-0.0685 (-1.31)		0.1509* (-1.78)
LEE				0.0708 (1.39)					0.0058 (0.11)		-0.3705*** (-2.67)
LLE					0.8811*** (4.77)					0.6414*** (2.48)	1.0517*** (5.77)
LIMR						-0.3655*** (-6.10)				-0.9785* (-1.68)	-3.4192 (-1.86)
LU5MR							-0.2190*** (-5.16)			-0.2630 (-0.59)	1.0332 (0.85)
LHE								0.0684 (1.18)		-0.0591** (-2.32)	-0.0375* (-1.69)
POP	-0.0111 (-0.48)	-0.0797* (-1.72)	0.0118 (0.28)	-0.0087 (-0.21)	-0.0143 (-0.72)	0.0106 (0.58)	0.0127 (0.69)	-0.029*** (-3.98)	0.0093 (0.22)	-0.1040*** (-2.49)	-0.1708 (-1.05)
INF	-0.0019*** (-2.61)	-0.0024** (-2.44)	-0.0032** (-2.18)	-0.0010 (-0.75)	-0.0017*** (-2.55)	-0.0016** (-2.37)	-0.0017*** (-2.63)	0.0020* (1.80)	-0.0016 (-1.18)	-0.0026 (-0.99)	0.0101** (2.21)
LOPN	0.0145 (0.41)	0.1120** (2.20)	0.0759 (1.35)	0.0502 (0.68)	0.0384 (1.236)	0.0041 (0.14)	0.0154 (0.51)	0.0683 (1.60)	0.0994* (1.79)	0.0898 (0.80)	0.7133*** (4.97)
F test	1194.46***	728.87***	449.23***	335.3	2667.62***	2831.64***	2759***	2782***	245.11***	593.44***	196.45***
No. of countries	16	15	13	13	16	16	16	16	13	16	13
No. of Instruments	290	188	144	131	331	331	331	223	99	118	44
No of observation	304	192	144	131	345	345	345	223	98	118	38
AR(1) p-value	0.004	0.014	0.021	0.011	0.026	0.078	0.077	0.080	0.069	0.083	0.090
AR(2) p-value	0.463	0.524	0.655	0.391	0.435	0.432	0.443	0.421	0.514	0.731	0.811
Hansen test	0.202	0.350	0.375	0.148	0.279	0.158	0.288	0.169	0.278	0.165	0.250
Hansen p-value											

Note: Figures in parentheses are t-stat. of the estimates; and "***", "**", and "*" indicates 1%, 5%, and 10% significant levels, respective