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Dynamics of Human Capital and Economic Growth in West African Countries: A Panel Data Approach

Ali Salisu[1] and Hafiz Umar Bubari[2]

[1]*Department of Economics, Bayero University Kano, Kano State, Nigeria*
Corresponding author E-mail: alisalisubeto@gmail.com

[2]*Department of Economics, Bayero University Kano, Kano State, Nigeria*

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Abstract: Recognition had been made of no significant economic growth by any country without adequate development in her human capital. Looking at the "Asian tigers" such as Malaysia, India, Singapore, and South Korea made investment in education and health a top priority for decades, they have gradually leaved the class of developing economies. Singapore, a small country with virtually no natural resources, has become one of the most developed countries in Asia, primarily due to significant investments in developing her human capital. This shows that human capital is a key to the relevance of other forms of capital. To better understand human capital and economic growth, this study investigates the "dynamics of human capital and economic growth in West African countries" from 7 sampled West African countries covering a period of 17 years (2000-2016) based on annual panel series data availability. Five macroeconomic variables were selected based on theoretical and empirical evidence. The study conducted pre-estimation tests such as; summary descriptive statistics, Pearson's matrix correlations and panel unit root test. The test results revealed that, the variables under study are properly screened for more advanced statistical regressions. the co-integration resultrevealed that, majority of the seven "within" and "between" dimensions tests have confirmed the significant existence of co-integration amongst the variables The central conclusion is that there is the existence of a long-run equilibrium relationship among the variables Therefore, the study recommends that, West African government`s expenditures on education and health should be increased so as to rise the literacy rate and life expectancy rate level and to RGDP of West African countries.

Keywords: Economic Growth, Human capital, Panel Co-integration

1. Introduction

Human capital has been recognized as one of the major factor that is responsible for the wealth of nations; according to Smith (1776) human capital refers to the acquired and useful abilities of all the inhabitants of the society (see Miyanda and Seshamani, 2017). This clearly indicates that human capital is simply value addition to an individual in form of education and health in order to generate outcomes of the value to the individuals and society. Capital and natural resources are passive factors of production; human beings are the active agents who accumulate capital, exploit natural resources, build a social, economic and political organization, and carry forward national development. Clearly, a country which is unable to develop the skills and knowledge of its

people and utilize them effectively in the national economy will be unable to develop anything else (Miyanda and Seshamani, 2017).

The dynamics of human capital and economic growth is important, especially in West African countries where the expenditure on human capital development index of 0.427 is far behind than that of other regions of the world. For instance, Europe and Central Asia 0.771, Latin America and the Caribbean 0.741, East Asia and the Pacific 0.683, Arab States 0.652, North Africa 0.652, Southern Africa 0.516, Central Africa 0.466 and East Africa 0.462 (UNDP, 2018). Because the majority of West African countries have poor performance in key development indicators such as Growth Domestic Product (GDP), life expectancy and education enrolment etc. For these reasons health and education in the Millennium Development Goals (MDGs), were given considerable preference. Following the MDGs, developing countries are encouraged to increase their investment in education and health as their impact on social welfare; poverty reduction and productivity are well-known (Jude, Hilaire and Gilles, 2015).

This paper seeks to investigatethe direction of causality between human capital and economic growth in West African countries taking economic growth as the dependent variable while the components of human capital are the predictor variables. This paper is unique because it enhanced the current understanding of the existing body of knowledge between human capital and economic growth in West African countries.

2.1. Conceptual Literature Review

2.1.1 Human capital

Human Capital refers to the stock of skills, knowledge, ideas, talent, personalities attributes and health status embodies in individuals which facilitate their ability to perform labour for the creation of personal, economic and social value (Simon and Maurice 2016; Ogujiuba 2013; OECD, 2011).

Simon-Oke (2012) opines that the concept of human capital refers to a conscious and continuous process of acquiring and increasing the number of people with requisite knowledge, education, skill and experience that are crucial for the economic development of a country. Furthermore, the concept of human capital has also be defined as "an amalgam of factors such as health, education, experience, training, intelligence, energy, work habits, trustworthiness, and initiative that affect the value of a worker's marginal product" (Osekhebhen and Shirley, 2014). Therefore, the study confined to the above conceptual clarifications of human capital.

2.1.2 Economic growth

Base on their conceptual clarification, *Solow and Robert (1956) opines* Economic Growth as an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. It can be measured in

nominal or real terms, the latter of which is adjusted for inflation. Traditionally, aggregate economic growth is measured in terms of Growth Domestic Product (GDP), although alternative metrics are sometimes used.

Helpman and Elhanah (2004) opines that "Economic Growth" refers to the geometric annual growth in GDP between the first and the last year over a period of time; this growth rate is the trend in the average level of GDP over the period, which ignores the fluctuations in the GDP around this trend.

Economic growth is the increase in the capacity of inflation-adjusted market value of the goods and services produced by an economy over time. It is on the basis of the value of the economic growth that countries are classified as high, medium or low economies (Hendrik, 2018).

2.2. Empirical Literature

There have been several empirics on human capital and economic growth using time series, and panel data. Some of these studies are country-specific while others are cross-country. These studies have come with mixed results. Some of these studies are selected and reviewed as follows:

Amassoma and Nwosa (2011) studied the causal nexus between human capital Investment and economic growth in Nigeria for sustainable development in Africa at large between 1970 and 2009 using a Vector Error Correction (VEC) and pairwise granger causality methodologies. The findings of the Vector Autoregression (VAR) model and pairwise estimate reveal no causality between human capital development and economic growth. Also, the study identified that labor mismatch is an issue that government needs to reckon with in order to accelerate and sustain economic growth. Contrarily, Adelakun (2011) conducted a study on human capital development and economic growth using OLS technique and found that there was a positive relationship between government expenditure on education and health as well as pattern of enrolment in primary, secondary, and tertiary institutions in enhancing economic growth in the long run.

Linda (2013) investigated the relationship between human capital development and economic growth using simple production function to estimate the human capital impact on labor productivity and found that female human capital has positive impact on labor productivity during the period of study. Eric (2013) focused on human capital as a driver of economic growth for developing countries. He argued that this has led to undue attention on school attainment. Then, he noticed that the attention that has been shifted to issues of school quality in developing countries have been much less successful in closing the gaps with developed countries. The study concluded that without improving school quality, developing countries will find it difficult to improve their long run economic performance.

Mba, Mba, Ogbuabor and Ikpegbu (2013) evaluated the relevance of human capital development on Nigerian economic growth using OLS. They found a

strong positive relationship between human capital development and economic growth using primary school enrolment, public expenditure on education and health, life expectancy and stock of physical capital to proxy human capital. Equally, Ogujiuba (2013) examined the relationship between economic growth and human capital development and found that investment in human capital in the form of education and capacity building at the primary and secondary levels impact significantly on economic growth, while capital expenditure on education was insignificant to the growth process. Mehrara and Musai (2013) investigated the causal relationship between education and GDP in developing countries by using panel unit root tests and panel co-integration analysis for the period 1970-2010; the study showed a strong causality from investment and economic growth to education in these countries. Yet, education does not have any significant effects on GDP and investment in the short-run and long-run. Jaiyeoba (2015) empirically investigated the relationship between investment in education and health in Nigeria, using time series data from 1982 to 2011 using trend analysis, the Johansen co-integration and ordinary least square technique. Empirical findings however indicated that there is a long-run relationship between government expenditure on education, health and economic growth. Correspondingly, Oladeji (2015) investigated the relationship between human capital (through education and effective health care services) and economic growth in Nigeria, using annual time series data from 1980 to 2012; the paper employs OLS methodology. The result shows that considering the magnitude, 1% increase in GDP is brought about by 22% increase in human capital. This postulates that an increase in allocation to education and health will lead to increase in GDP. The estimated value of R^2 (goodness of fit) of 0.80 or 80% and it show that the independent variables explain about 80% of the variation in the dependent variable. The findings have a strong implication on educational and health policy in Nigeria. The study seems to suggest that a concerted effort should be made by policymakers to enhance educational and health investment in order to accelerate growth which would engender economic growth.

Simon and Maurice (2016) examined human capital development indicators such as government capital expenditure on education, government recurrent expenditure on education, literacy rate and school enrolment rate on productivity growth in Nigeria. The study used secondary data from 1980-2013. The Error Correction Modeling (ECM) technique was used to analyze the relationship between human capital development and productivity growth over the specified period through the OLS framework. It was found that government recurrent expenditure on education; literacy rate and school enrolment rate positively and significantly affect productivity growth in Nigeria. However, government capital expenditure on education records negative but significant relationship with productivity growth.

2.3. Theoretical Frameworks

Human Capital Theory

Human capital theory shows how education leads to increase in productivity and efficiency of workers by increasing the level of their cognitive skills. Schultz (1902-1988) and Becker (1930) introduced the notion that people invest in education so as to increase their stock of human capabilities which can be formed by combining innate abilities with investment in human beings. Examples of such investments include expenditure on education, on the job training, health, and nutrition. However, the stock of human capital increases in a period only when gross investment exceeds depreciation with the passage of time, with intense use or lack of use. The provision of education is seen as a productive investment in human capital, an investment which the proponents of human capital theory considers to be equally or even more equally worthwhile than that in physical capital. Human capital theorists have established that basic literacy enhances the productivity of workers low skill occupations. They further state instruction that demands logical and analytical reasoning that provides technical and specialized knowledge increases the marginal productivity of workers in high skill or profession and positions (Babalola, 2000) Moreover, the greater the provision of schooling and healthier society, the greater the increase in national productivity and economic growth.

3.1. Methodology

Model Specification

The theoretical model for this study was adopted from Cobb-Douglas (1947) production function framework as modified by Solow (1957) and augmented by Mankiw, Romer and Weil (1992). However, the model used in this study followed the work of Obialor, (2017) who examines the effect of human capital investment on economic growth of three Sub-Sahara African countries. His model was specified as follows:

$$GDP = \alpha_0 + \alpha 1GIH + \alpha 2GIE + \alpha 3LR + \mu \quad (1.1)$$

Where;

GDP = Growth rate of the GDP at current market prices; it is the dependent variables.

GIH = Government Investment on Health; it is proxied by Public Health expenditure.

GIE = Government Investment on Education; it is proxied by public spending on education. LR = Literacy Rate; it is represented by school enrolment. $\alpha 0$ = is a constant or intercept. $\alpha 1$, $\alpha 2$ and $\alpha 3$ = are the coefficients of the explanatory variables while μ is stochastic error term.

To make the model significant and to suit the study at hand, the model was metamorphosed to include the vibrant components of human capital, which the study is poised to achieve as specified in the objectives of the study for appropriate analysis. Such components are: Government Expenditure on Education (GEE), Government Expenditure on Health (GEH), Literacy Rate (LR) and Life Expectancy rate (LE); the variables were included to capture government investment and effectiveness in human capital. Hence, the functional specification of the model is as follows:

$$RGDP = f\ (GEE, GEH, LR, LE) \tag{1.2}$$

While the mathematical specification of the model is expressed as follows:

$$RGDP_{it} = \alpha_0 + \alpha 1 GEE_{it} + \alpha 2 GEH_{it} + \alpha 3 LR_{it} + \alpha 4 LE_{it} \tag{1.3}$$

Specifying the above equation 1.3 from mathematical in to an econometrics model by introducing stochastic error term in order to properly estimate the parameters of the postulated model, we rescale the variables by taking the logarithms form and conducting a step-wise regression for estimation purpose with constant returns to scale will take the following form:

$$LogRGDP_{it} = \alpha_0 + \alpha_1 LogGEE_{it} + \alpha_2 logGEH_{it} + \alpha_3 LR_{it} + \alpha_4 LE_{it+}\ \mu_{it} \tag{1.4}$$

Where; log represents the logarithm of RGDP, GEE and GEH (note: the log of LR and LE was not taken as the series was in small decimal places). Where; subscript i and t is the country's cross-sectional dimension and country's time-period dimension respectively. Where; $\alpha 0$ is a constant or intercept while $\alpha 1$, $\alpha 2$ and $\alpha 3$ are the coefficients of the explanatory variables and the "α" is the elasticity of human capital with respect to RGDP; however, it is predicted that the $\alpha_1\ \alpha_2\ \alpha_3\ \alpha_4 > 0$. This means, the elasticity has a positive relationship with the dependent variable; and a unit change in either of the independent variables will bring about a proportionate change in the RGDP "*ceterisparibus*". Where; μ_{it} is the stochastic term. As time-varying analysis, the equation specifies that the output variable depends linearly on its own previous values and on degree of uncertainties; as such, the μ_{it} provides an explanation for the difference between the results of the equation and actual observed results. Therefore it is predicted that the variances of the μ_{it} in the equation should held constant over time (homoskedastic).

4.1. Results and Discussion

Pre-estimation Tests

This section entails preliminary analyses of data such as descriptive statistics and Pearson's correlation matrix of variables under study; the section also deals with panel unit root test and panel co-integration test to ensure that the variables are properly screened in order to obtain reliable results from the model estimation and interpretations.

Descriptive Statistics and Correlation of Matrix

Agung (2004) pointed out that summary descriptive statistics for variables in a data set have a very important role in data evaluation and measurement of each variable for further advance statistical analysis. Table 4.1 presents the summary descriptive statistics for the variables under study. For the mean and median statistics, the series, Real Growth Domestic Product (RGDP), Government Expenditure on Health (GEH), Literacy Rate (LR) and Life Expectancy Rate (LE) display a high level of consistency as their mean and median values are within the expected range of maximum and minimum values of the series; while Government Expenditure on Education (GEE) posits low level of consistency as its mean and median values are not within the expected range of maximum and minimum values of the series. For standard deviation, which measures the amount of variation of the data set values, the series, RGDP, GEH and LR deviations of actual data from their mean value are very small as expected while GEE and LE are very large. For skewness, the variables RGDP (0.954599), GEH (0.821943) and LR (0.651526) are positively skewed as expected; this indicates that observed values of the variables have a long tail to the right while GEE (-0.244068) and LE (-0.267455) variables are negatively skewed. For the Kurtosis statistics which measures the peakness or flatness of the distribution of the series; all the series as expected, RGDP (2.861285), GEE (2.247934) GEH (3.055530) LE (2.474435) LR (3.272881) are flat (platykurtic) relative to the normal. Finally, the Jarque-Bera statistics which factors in both the skewness and kurtosis for testing normality in the series, the null hypothesis of a normal distribution is accepted for all variables RGDP (8.16870), GEE (3.985901), GEH (3.41449), LE (2.788310) and LR (8.788200); it can be concluded that RGDP, GEE, GEH, LE and LR are normally distributed as expected.

For matrix correlation, Pearson's correlation coefficient was employed to examine the extent of relationship between the variables; the correlation matrix shows the magnitude and direction of the relationship between each pair of variables being analyzed. According to the technique, the nearer the correlation coefficient to one (1) the stronger the strength; a negative correlation shows that there is an inverse relationship between the two variables. The correlation matrix is symmetric about the diagonal and the values of the diagonal are 1.000000, since there is a perfect correlation of the variables with itself (Helwig, 2017). Table 4.1 excavated that Government Expenditure on Education (GEE) -0.222615, Government Expenditure on Health (GEH) -0.564302 and Life Expectancy Rate (LE) -0.182337 conjugates an inverse positive relationship with Real Growth Domestic Product (RGDP); in the same vein, there exist a positive relationship between RGDP and Literacy Rate (LR) 0.923923. Summarily, it can be concluded that GEE, GEH, LE and LR has a conjugal and blissful agreement with RGDP.

Table 4.1: Descriptive Statistics and Correlation of Matrix

	$LOGRGDP_{it}$	$LOGGEE_{it}$	$LOGGEH_{it}$	LE_{it}	LR_{it}
Mean	7.943704	16.98322	1.246216	54.51362	5.509528
Median	7.801472	17.67808	1.048900	55.57800	5.479159
Maximum	9.632192	30.70003	3.140808	67.14600	6.798169
Minimum	7.066990	4.770660	0.331457	38.70200	4.429034
Std. Dev.	0.767081	5.684786	0.607676	6.255189	0.569361
Skewness	0.954599	-0.244068	0.821943	-0.267455	0.651526
Kurtosis	2.861285	2.247934	3.055530	2.474435	3.272881
Jarque-Bera	8.16870	3.985901	3.41449	2.788310	8.788200
$LogRGDP_{it}$	1.000000	-	-	-	-
$LogGEE_{it}$	-0.222615	1.000000	-	-	-
$LogGEH_{it}$	-0.564302	-0.085872	1.000000	-	-
LE_{it}	-0.182337	0.184771	0.177306	1.000000	-
LR_{it}	0.923923	-0.159703	-0.618120	-0.248229	1.000000

Source: Computed and Compiled by the Researcher using E-Views 10 (2018)

Panel Unit Root Test

Levin, Lin and Chu (2002)and Im, Pesaran and Shin (1997) tests were conducted on the variables, to determine whether they are stationary or non-stationary. The two tests were employed to reinforce one another, to ensure their robustness and to boost confidence in their reliability. The tested null hypotheses for both unit root tests are to determine the presence of a unit root. The decision rule is to reject the null hypothesis when the test-statistical value is less than the probability value or posits higher negative values (William, Hill, and Lim, 2008). The panel unit root test was done at levels and at first difference as presented in Table 4.2. The result shows that only LE that is stationary at levels; this suggests the need to difference the other variables to achieve stationarity. Upon taking their first difference, all other variables became stationary. This means that LE is integrated at 1(0) while RGDP, GEE, GEH and LR are integrated at 1(1).We can therefore conclude that the seriesis significantly reliable for co-integration analyses.

Table 4.2: Panel Unit Root Test Results

Variable	*LEVEL*				*FIRST DIFFERENCE*				
	LLC	*Prob.*	*IPS*	*Prob.*	*LLC*	*Prob.*	*IPS*	*Prob.*	*Order of Integration*
$LOGRGDP_{it}$	-0.41717	0.3383	0.09089	0.5362	-7.2975	0.0000*	-6.49772	0.0000*	I(1)
$LOGGEE_{it}$	-1.74683	0.0403	-2.77470	0.0028	-10.639	0.0000*	-9.10138	0.0000*	I(1)
$LOGGEH_{it}$	-3.44221	0.0003	-0.70372	0.2408	-9.34014	0.0000*	7.18591	0.0000*	I(1)
LE_{it}	-8.36767	0.0000*	-13.2461	0.0000*	-	-	-	-	I(0)
LR_{it}	-1.78280	0.0373	0.23000	0.4090	-5.1665	0.0000*	-6.06827	0.0000*	I(1)

Source: Computed and Compiled by the Researcher using E-Views 10 (2018)
The asterisks * indicate rejection of null hypothesis at 1%

4.2. Panel Co-integration Test

Co-integration became an over-riding requirement for any economic model using a series data. Pedroni's (2000) co-integration method was adopted to determine the long-run equilibrium relationship amongst the variables under study. The test was done based on the two classified broad categories of "Between" and "Within" dimensions. The optimal lag was automatically decided base on Schwarz Information Criterion (SIC); the lag interval indicates the number of periods it takes the combination of the variables to co-integrate (if any). The decision rule is to reject the null hypothesis of no co-integration if probability value is less than 5% (0.05) level of significance. Otherwise, do not reject. In the same vein, the null hypothesis is to be rejected if panel or group "t" and "r" statistics possess large negative values. So also the null hypothesis is to be rejected if panel "**v"** statistic possesses large positive value. Otherwise, do not reject.

Table 4.3 revealed that, majority of the seven "within" and "between" dimensions tests have confirmed the significant existence of co-integration amongst the variables The central conclusion is that there is the existence of a long-run equilibrium relationship among the variables. That is, the linear combination of these variables cancels out the stochastic trend in the series. The variables may wander (walk) away from themselves, but in the long-run, there is existence of relationship amongst them.

Table 4.3: Pedroni Panel Co-integration Test Results

Alternative hypothesis: common AR coefs. (within-dimension)		
	Statistic	*Prob.*
Panel v-Statistic	2.327591	0.0100**
Panel rho-Statistic	-0.470493	0.0010*
Panel PP-Statistic	-0.034163	0.0124**
Panel ADF-Statistic	-0.047121	0.4812
Alternative hypothesis: individual AR coefs. (between-dimension)		
	Statistic	*Prob.*
Group rho-Statistic	0.144981	0.0254**
Group PP-Statistic	0.176270	0.0000*
Group ADF-Statistic	**0.049518**	**0.5197**

Source: Computed and Compiled by the Researcher using E-Views 10 (2018)
The asterisks *, ** indicate rejection of null hypothesis at 1% and 5% respectively

5.1. Conclusion and Recommendation

The study employed econometrics analytical techniques including descriptive statistics and matrix correlation of variables; Levin, Lin and Chin (LLC) and Im, Pesaran and Shin (IPS) for panel unit root tests; as suggested from the unit root test, Pedroni's (2000) co-integration method was adopted to determine the long-run equilibrium relationship amongst the variables under study between human capital and economic growth in West African countries taking

economic growth as the dependent variable while the components of human capital are the predictor variables. revealed that, majority of the seven "within" and "between" dimensions tests have confirmed the significant existence of co-integration amongst the variables The central conclusion is that there is the existence of a long-run equilibrium relationship among the variables.

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