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Endogenous growth model and the human capital development: Evidence from the West African Monetary Zone (WAMZ)

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Abstract. This study examined the effect of human capital development on economic growth in the context of West Africa Monetary Zone (WAMZ) countries for the period 2001 – 2019. The data for the study were sourced from World Development Indicators of the World Bank for the six (6) ECOWAS countries. The panel least squares (random effects and fixed effects modeling) were embraced as the estimation techniques. The empirical result of the study reveals a positive coefficient and statistically significant at 1% significance level in the fixed – effects model of the following macro economic variables government expenditure on education, Labour force and Population growth rate suggesting that they significantly stimulate economic growth in WAMZ countries. On the other hand government expenditure on health and investment income ratio had negative co-efficient with only investment income ratio statistically significant at 1% significance level. This indicates that urgent government action is required to reverse these negative trends in order to encourage health and investment contribution to economic growths in WAMZ countries. The study recommended among others that government of WAMZ countries should increase budget allocation to the education and health sectors for infrastructure and personnel development to foster a healthy work force that will promote economic growth.
Keywords. West Africa Monetary Zone; Secondary school enrolment; Government expenditure on education; Total labour force.
JEL. F43; J24; O11.

1. Introduction

Human capital is relevant to productivity and growth. This is because the fulcrum of productivity and growth is human capital-predicated. In this broad sense, human capital plays and will continue to play an essential role in nations' economic growth as well as in their poverty alleviation architecture. For developing economies to be able to cope, develop a competitive cutting-edge and sustain it, human capital development becomes one of the most strategic policy instrument. From the macro-economic perspectives for instance, human capital development enhances labour productivity; facilitates technological innovations; increase

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returns to capital; and makes growth sustainable. In other words, from the macro perspectives human capital is a key factor in the economy wide production function. On the other hand, from the microeconomic perspectives human capital development is construed as education, training and retraining programmes that tend to increase the probability that individuals will be gainfully employed, which goes to improve their earning capacities as well as raising their self-esteem. Thus, from the micro level perspectives Human Capital Development is considered a component of education that enhances labour productive levels, earnings and as well as an essential component of the production process.

Human capital constitutes an important component of national and individual asset necessary for increasing productivity and sustaining competitive advantage in present day knowledge driven global economy. (Schultz, 1993). Human capital is the information, skills, competencies and attributes embodied in people that facilitate the creation of private, social and economic well-being (OECD, 2001). The development of human capital is an essential contributor to economic growth, according to modern growth theory. Many cross - country studies have extensively examined whether educational achievement can significantly contribute to the production of total output in an economy. In this regard, macro studies have produced inconsistent and controversial results (Pritchett, 1996). However, several micro studies have consistently shown a positive relationship between workforce education, labour productivity and income (Trostel, Walker & Woolley 2002; Psacharopoulos & Patrinos 2004).

2. Conceptual and theoretical literature review

Human capital is considered a knowledge-based concept; it is construed as the productive wealth embodied in labour, skills and knowledge. It is represented by the aggregation of investment in activities including education, health, on-the-job training, migration etc which goes to enhance individual's productive levels. This chapter therefore examines both theoretical and empirical studies on the impact of the development of human capital on (output) growth.

Several theories of human Capital development and economic growth exist in the literature. The theory of human capital is based on the assumption that formal education is extremely important and necessary to improve a population's productive capacity. Some human capital theorists argue that an educated population is a productive population. The provision of formal education is considered an investment in human capital, that the theory's advocates take to be equally or perhaps additional valuable than physical capital (Woodhall, 1997).

2.1 Human capital development at the micro level

At the micro level, the idea postulates that the individual bears the prices of education (direct prices like fees paid and indirect costs like the price of

chance for students) as a result he / she expects this investment to produce a future stream of benefits for him / her (higher productivity and better wages). There is a substantial quantity of literature and analysis to focus on this fact: for example, Romer (1990); Mankiw, Romer, & Weil (1992); Baro & Sala-i-Martin (1997) the accumulation of human capital through education and on the job coaching will improve economic growth by raising labor productivity, promoting technological innovation and adaptation, and reducing labour force fertility.

According to Bills & Klenow (2000) and Krueger & Lindahl (2001), the cause are often reversed - that's, economic process will increase education returns and therefore ends up in additional education - they argue that the data seems to be stronger in this direction. Bills & Klenow (2000) show that education to growth effects accounts for less than one-third of the discovered correlation between education and growth, they arguing that the results of previous studies were mainly due to omitted variable bias. Similarly, Krueger & Lindahl (2001) argue that compared to micro-level studies cross country macro level studies suffer more from reverse causation (i.e. in cross - country data, it is tough to seek out valid instrumental variables) and omitted bias variables. In order to research the economic impact of education, micro - level analysis where these problems are often probably resolved may be a lot appropriate.

2.2. Human capital development at the macro level

At the macro level, Robert (1991) developed a human capital model which shows that education and the creation of human capital is responsible for both the differences in labour productivity and the differences in overall levels of technology that we observe in the world today.

Solow (1957) economic model, used to determine a county's estimated output and capital accumulation, was eventually extended to include the effects of varying human capital on a country's economy. While the capital accumulation equation accounts for saving's rate, capital depreciation, and technology growth, the added human capital variable gives another measurable input to determine a country's estimated national output. Human capital can be explained as the effective units of skilled labour in the work force and the Solow Model assumes all labourers invest time in learning new skills and increasing the effectiveness of their labour.

As demonstrated in the Solow Model, human capital plays a significant part in cross-country differences between productivity and overall output per worker. Similar to the stark effects of capital investment in a country's per person capital accumulation, a change in human capital per worker has a positive relationship with output per worker in the steady-state. This reality is evaluated when changes to a national education policy are considered, as well as when examining the policy changes countries with a recent growth in GDP, have made to cause their positive growth. By understanding this principle, highlighted in the Solow Model, we can make a better case for the expansion of access to education in the US and in

countries looking to rise out of poverty. From the macro perspective, Muhammad, Azman & Naseem (2020), adjudged that the availability of human capital in a country can act as a stimulus to the inflow of foreign direct investment.

2.3. Empirical literature

Cross-country empirical studies have confirmed the positive relationship between educated labour force and economic growth. Azariadis & Drazen (1990) found that a country's literacy rate in 1960 is a significant determinant of per capita GDP growth for the period 1960-1980; and literacy rates and initial per capita GDP in 1960 jointly account for 38% of the changes in economic output in the 20 year period.

Mankiw, Romer & Weil (1992) find that in non - oil exporting countries, the elasticity of GDP per capital at the rate of enrolment is 0.66 and 0.76 in OECD countries. Their findings show that differences in enrolment rates can explain non convergence in incomes during 1960-1985. Conversely, the application of the Mincerian specification Barro & Lee (2010) estimated that the boost in the average year of schooling by 1 year increases GDP per capita by 1.7 percent to 12.1 percent, depending on the specification (i.e. random regression against fixed effects).

Ovenseri-Ogbomo & Ihensekhien (2017) established the relationship between human capital and economic growth in West Africa using the Arenllano-bond dynamic panel estimation model. The endogeneity problem often associated with panel data analysis was mitigated with the use of the generalized method of moments (GMM). The research shows that government expenditure on health care provision is statistically insignificant to growth in West Africa. The result also shows that there is no significant correlation between economic growth and the delay in the enrollment of primary, secondary and tertiary schools and government education expenditure in West Africa (Oveneri-Ogbomo & Igbinedion, 2019).

Adeyemi & Ogunsola (2016) adopted the ARDL Cointegration technique in their study of the impact of the development of human capital on economic growth in Nigeria with secondary school enrolment; life expectancy rate, government expenditure on education, gross capital formation and economic growth as variables from 1980 to 2013, achieved a positive long - term relationship between all variables.

Sulaiman *et. al.,* (2015) investigated the impact of human capital and technology on economic growth in Nigeria. The result from the estimated model, using ARDL technique on annual time series data for 35 years period revealed that secondary schools and tertiary school enrollment and technology had significant positive impact on economic growth.

Nwakanma & Nnamdi (2013) assessed the effectiveness of government based health care financing with comparison with private-based health expenditure and health profile of all the West African countries. Applying a comprehensive descriptive analysis of health care financing and health profile of all the West African countries and comparability of developing and

developed countries their data show great variation across countries in health expenditure as a share of GDP, which ranges from 1% to 4%. Private share of overall health spending was found to be much higher in Cote d'Ivoire, Guinea-Bissau, Mali, Liberia, Mauritania and Nigeria, which is reflected on their corresponding low-health profile at prefecture level.

Sharif, Ahmed & Abdullah (2013) examined the impact of human capital resources development on economic growth in Bangladesh. The Engle-Granger Cointegration tests suggested a positive relationship between human resources development activities and economic growth process of Bangladesh with education showing a higher stimulating role than R&D to economic growth.

2.4. Endogenous growth theory

The theory of endogenous growth maintains that economic growth is mainly attributed to internal and not external forces (Romer, 1994). The theory of endogenous growth states that development of human capital, innovation and knowledge contribute significantly to productivity and growth. The theory also focuses on positive externalities and the impact of a knowledge - based economy on economic development. The theory mainly maintains that an economy's long - term growth rate depends on policy measures. For example, research and development and educational subsidies increase the rate of growth in some endogenous models by escalating innovation and technological advancement.

Some segments of growth theorists have expressed dissatisfaction on the use of simple accounts of internal factors to determine long-run growth in the mid-1980s. Rather they preferred a model that replaced the exogeneous growth variable (unexplained technical progress) with a model in which the variable was explicitly the key determinant of growth. This opinion was based on the research work of Arrow (1962), Uzawa (1965) and Sidrauski (1967), Lucas (1991), Romer (1986), Lucas (1988), Rebelo (1991) and Santos (1997); in these models growth was seen to be due to continuous investment in human capital development which has positive impact on the economy that reduced the decreasing return on capital accumulation (Barro, & Sala-i-Martin, 2004). By implication endogenous growth theory embraces policies that are open, competitive and open to changes as well as innovations that will promote growth (Fadare, 2010).

3. Theoretical framework and methodology

This study is predicated on the augmented Solow model developed by Mankiw, Romer & Weil (1992). Drawing from the theoretical foundation endogenous growth model earlier developed; suffice it therefore to provide a link between human capital development and economic growth. It is assumed that human capital is decomposed into education and health variables. This is consistent with Romer (1990) and Mankiw, Romer & Weil (1992) that education and health contribute to economic growth.

3.1. Model specification

Following the human capital theory, theoretical and empirical review of the impact of human capital development on productivity and by extension economic growth, this study employed the augmented Solow's human capital growth model which is an improvement on the original Solow growth model. Although, Solow did not explicitly incorporated human capital, it was Mankiw, Romer & Weil (1992) who came up with the augmented Solow's model. The augmented Solow's model is specified as:

$$Y = AK^{Б} (hL)^{\beta} \quad (1)$$

Where Y = output level or economic growth; K = stock of physical capital; h = level of human capital; L= labour measured by the number of workers; A = Total Factor Productivity; Б = elasticity of capital input with respect to output; β = Elasticity of labour input with respect to productivity (Output).

The above is econometrically stated as:

$$Y = Ak^{Б} (hL)^{\beta} e^{ut} \quad (2a)$$

Transformation into log-linear form will be;

$$\text{Log } Y = Б_0 + Б_1 \log K + \beta \log (h+L) + W \quad (2b)$$

Where $Б_1$ = Log A and W = log U

However, to achieve a robust form in WAMZ context, the augmented Solow human capital-growth model would be modified to take expenditure on education and health as additional variables. Total expenditure on education and health will include recurrent and capital expenditure. These additional variables are based on the premise that education and health are major ways of human capital development. This expanded model will be in the form;

$$\log Y_{it} = Б_o + Б \log K_{it} + \beta_1 \log h_{it} + \beta_2 \log L_{it} + \psi_1 \log GTEE_{it} + \psi_2 \log GTEH_{it} + \Psi \log Pop_{it} + u_{it}. \quad (3)$$

Output level or economic growth (Y) was proxied as real gross domestic product; stock of physical capital (K) was proxied by income investment ratio (h) human capacity development was measured by enrolment rates; (L) labour force; GTEE is re-current and capital expenditure on education, GTEH is recurrent and capital expenditure on health and Pop is population growth; i represents cross section which were the six (6) WAMZ countries and t stands for time dimension.

$$RGDP_{it} = f(\lambda_{it}) \quad (6)$$

Where,

$RGDP_{it}$ denotes economic growth of the i^{th} Country at time t.

i=1, 2, 3.....n (7)

Thus, the structural form of Equation (3) now becomes;

$$RGDP_{it}ECONG_{it} = \beta_0 \pm \varphi_i \sum_{i=o}^{n} \lambda_{i,t-i} + \mu_{it} \quad (8)$$

From the foregoing, the Autoregressive version of Equation 8 can be rewritten as follows;

$$Y_{it} = \beta_0 + \eta_i \sum Y_{it-i} \pm \varphi_i \sum_{i=o}^{n} \lambda_{it-i} + \mu_{it} \quad (9)$$

The estimated dynamic model derived in Equation 8 is represented as Equation 3.7 below:

$$RGDP_{it} = \beta_0 + \sum_{t=}^{k} \eta\, i\ RGDP_{it} + \sum_{i=0}^{i} \psi_{\,i}\ IYR_{it-1} + \sum_{i-0}^{m} \gamma_{\,i}\ HK_{it-i} + \sum_{i=0}^{n} \alpha_{\,i}\ LABF_{it-1} + 0\sum_{i=0}^{0} \omega_{\,i}\ GXEDU_{it-1} + \sum_{i=0}^{p} \phi_{\,i}\ GXH_{it-i} \sum_{i=0}^{q} \varphi_{\,i}\ GPOP_{it-i} + u_t \quad (10)$$

***a priori* expectation**

$\eta_i > 0; \Psi > 0; \gamma > 0; \alpha > 0; \omega > 0; \phi > 0; \varphi > 0$

β_0 is the intercept in the model

η_i, ψ_t, Υ_i α_i, and ω_i, ϕ_1, φ_1 are the impacts measuring parameters of the respective variables captured in the model.

μ_t is the stochastic disturbance term that captures every other variable that influences economic growth but not included in the estimation model.

Therefore, Equation 10 becomes the fundamental equation for this study; and forms the underlying framework on which subsequent estimations, analysis and discussions on the theme of this study are based. Data are incorporated in the model on the basis of availability. All variables are defined below:

Where; RGDP is Real Gross Domestic Product, IYR is Investment Income Ratio, HK is Human Capital (Secondary Schools Enrollment), LABF is Labour Force (Total Labour Force), GXEDU is Government Education Expenditure (Recurrent and Capital), GXH is Government Health expenditure (Recurrent and Capital), GPoP is Population Growth.

3.2. Estimation technique

To evaluate the impact of human capital development on economic growth, the study carried out a panel data stationary test. This is because;

the time dimension is reasonably large and might be pruned to unit root problem that might cause spurious regression results. However, there are two schools of thought on panel data unit root tests: homogenous and heterogeneous panel data unit root tests. Then the study further used panel data Cointegration tests of Pedroni and Kao panel Cointegration tests to establish long run relationship between the dependent and independent variables. The Panel Least Squares (fixed effects and random effects modeling) technique was used for the estimations of the above model.

3.3. Data sources

The data for the study were from various sources including World Development Indicator (WDI), World Bank Statistics, African Development Bank (ADB), Journals, International Organizations such as WHO, UNICEF, UNESCO; ECOWAS Commission Report etc data on human capital development and output indicators for ECOWAS countries within the period under study. The data covered the period 2001-2015 for the six WAMZ countries.

4. Results presentation

4.1. Stylized facts and trends analysis

School enrolment in ECOWAS countries

In the ECOWAS sub - region, the proportion of children completing primary schools rose from 52 percent to 67 percent in 2002 - 2010. Even above the SSA average, gender equality has improved. In terms of the completion rate of primary schools, indicators for 2011 show that rates in Ghana and Cape Verde exceed 90 %. More than 30 percent of children in most ECOWAS 79 countries do not complete their cycle. The primary completion rates in Burkina Faso and Niger are below 50 percent. The ECOWAS average in 2011 is 67% lower than the SSA average of 69.7%. The ECOWAS sub-region currently records the lowest rates of literacy in the world in terms of literacy rates. By 2009, 65 million adults in West Africa could neither read nor write, representing 40% (40%) of the adult population.

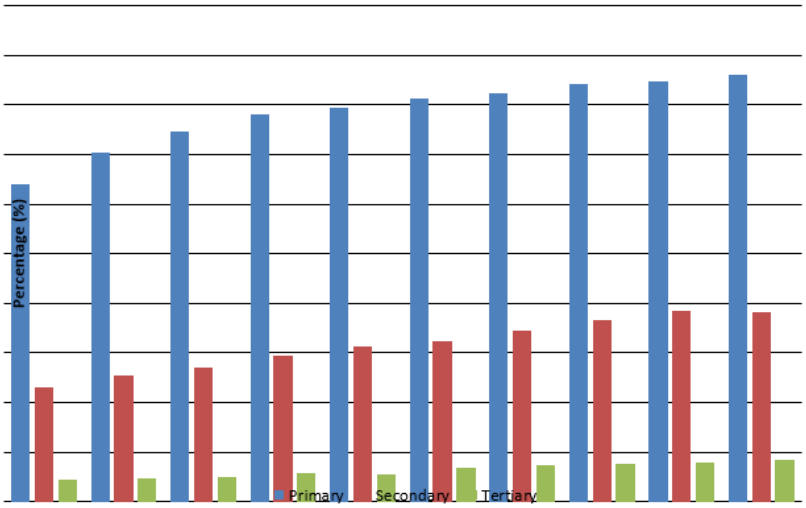

Figure 1. *Schools Enrolment in West Africa*
Source: Author's Design (2021)

In ECOWAS, averages of 35 percent of children of primary school age (39.7 percent for girls) are out of school, which is well above the SSA average of 21.5 percent in 2012. In fact, progress over the decade was marginal compared to the region (the rate in ECOWAS fell by only 3 percentage points, compared to 13 percentage points for SSA). However, only about 6 percent of primary school - aged children are out of school in Benin, Cape Verde and Togo, while the rate in all other countries exceeds 15 percent and in Burkina Faso, Cote - d'Ivoire, Niger and Nigeria exceeds 36 percent. For the entire ECOWAS region, this figure means that 17 million children of primary school age are out of school.

ECOWAS Countries Government Spending on Education

Education expenditure consists of current and capital expenditure on educational institutions and the administration of education. The proportion of government spending as a percentage of total government spending is an indication of a country's commitment to education development. Ghana, for example, allocated 23.1 percent of its resources to education, the

second highest in the sub - region, between 2006 and 2009. As of 2011, Ghana increased its share of total government expenditure to 30 %. Figure 2.5 shows the proportion of total education expenditure in some of the sub-region countries in 2009. After Cote d'Ivoire, Ghana ranked second in terms of the share of government spending on education. The three countries with the lowest shares in the sub - region are Liberia, Cape Verde and Benin.

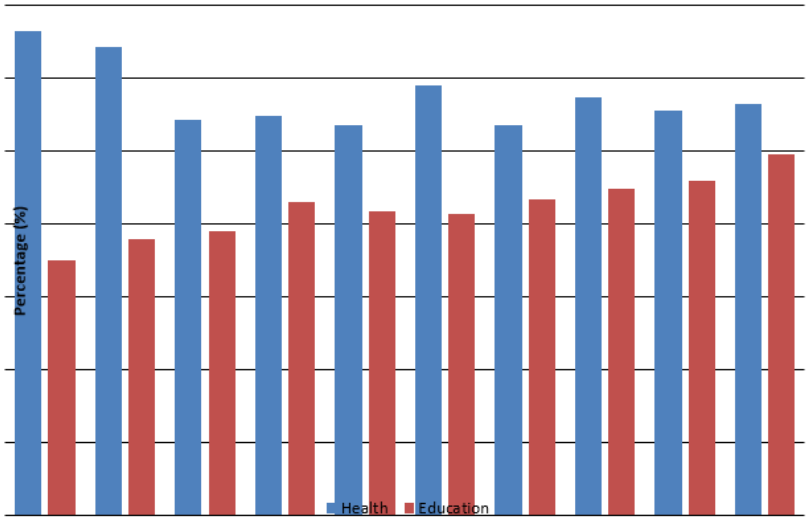

Figure 2. *Government expenditure in West Africa*

4.2. Descriptive statistics

The summary statistics of all the variables used in this exercise are presented and discussed in Table 4.1. The skewness and kurtosis values indicate asymmetry and peakedness of the distribution. From Table 4.1, all the variables were positively skewed. From the result also, economic growth (RGDP), population growth rate (GPOP) and labour force (LABF) are leptokurtic in distribution while government expenditure on education (GXEDU), government expenditure on health (GXH), human capital (HK) and income investment ratio (IYR) are platykurtic in their distributions.

Table 4.1. *Descriptive statistics*

	RGDP	GPOP	GXEDU	GXH	HK	IYR	LABF
Mean	1.97E+10	2.859835	3.785979	6.531323	40.39892	16.83070	10184777
Median	2.69E+08	2.648982	3.211540	4.982720	39.39114	16.30624	2861177.
Maximum	1.67E+11	4.974578	8.141020	16.44814	58.95700	41.68592	51167238
Minimum	160.5720	1.728854	1.034500	1.090810	17.15400	1.096810	513382.0
Std. Dev.	4.50E+10	0.705683	1.742688	4.596339	10.91856	8.767723	15724140
Skewness	2.139507	0.951779	0.497031	0.786993	0.025942	0.429172	1.704239
Kurtosis	6.072618	3.826695	2.385145	2.211851	2.259497	2.403134	4.173756
Jarque-Bera	83.25281	12.92087	4.098625	9.295829	1.653109	3.279013	38.98627
Probability	0.000000	0.001564	0.128823	0.009582	0.437554	0.194076	0.000000
Sum	1.42E+12	205.9081	272.5905	470.2553	2908.722	1211.810	7.33E+08
Sum Sq. Dev.	1.44E+23	35.35723	215.6243	1499.969	8464.266	5457.980	1.76E+16
Observations	72	72	72	72	72	72	72

Source: Author's Computation using E-view 10.0

4.3. Analysis of the pairwise correlation statistics

The correlation matrix is presented in Table 4.2. The result reveals the relationship among the variables used in the study.

Table 4.2. *Correlation statistics of all variables employed*

	RGDP	GPOP	GXEDU	GXH	HK	IYR	LABF
RGDP	1.000000	-0.153634	0.475315	0.369923	-0.189990	-0.318214	0.961022
GPOP	-0.153634	1.000000	-0.170718	-0.105810	0.163909	0.019410	-0.227513
GXEDU	0.475315	-0.170718	1.000000	0.235130	-0.036898	-0.005649	0.606167
GXH	-0.369923	-0.105810	-0.235130	1.000000	0.198537	0.316104	-0.279402
HK	-0.189990	0.163909	-0.036898	-0.198537	1.000000	0.495732	-0.208815
IYR	-0.318214	0.019410	-0.005649	-0.316104	0.495732	1.000000	-0.306280
LABF	0.961022	-0.227513	0.606167	-0.279402	-0.208815	-0.306280	1.000000

Source: Author's Computation using E-view 10.0

4.4 Panel Unit Root Test

The summary of the unit root tests for all the variables used in this study are reported in Table 4.3. The results reveal that all the variables under consideration have different orders of integration. The results as evidenced in Table 4.3 indicate that economic growth (RGDP) is stationary both at levels and first difference as revealed by the Levin, Lin & Chu, Im, Pesaran & Shin W-stat, ADF-Fisher as well as ADF-Choi, while Breitung test shows that it is non stationary. Similarly, the results indicate that population growth rate is stationary both at levels and first difference as given by the Levin, Lin & Chu, Im, Pesaran & Shin W-stat, ADF-Fisher as well as ADF-Choi unit root tests, while the Breitung test shows that it is non stationary.

The different unit root test techniques all indicate that government expenditure on education, government expenditure on health and human capital are non-stationary both at levels and first difference. Also, the Levin, Lin & Chu t-statistic showed that income investment ratio is difference stationary.

Table 4.3. *Stationarity test: The Levin, Lin and Chu and breitung approach*

Variables	Levin, Lin and Chu		Order of integration	Breitung		Order of integration
	Null Hypothesis: Unit root (assumes common unit root process)			Null Hypothesis: Unit root (assumes individual unit root process)		
	Statistic	Prob		Statistic	Prob	
RGDP	-5.49	0.000***	I(0) & I(1)	0.33	0.63	
GPOP	-20.34	0.000***	I(0) & I(1)	-0.34	0.37	-
GXEDU	3.58	0.99	-	0.33	0.63	-
GXH	-1.24	0.11	-	-0.59	-0.28	-
HK	-0.14	0.34	-	0.97	0.83	-
IYR	-3.26	0.0006***	I(1)	1.64	0.95	-
LABF	-2.75	0.0029***	I(0) & I(1)	-0.56	0.29	-

Notes: NB:*** implies Significant at 1%.

Source: Author's Computation using E-view 10

4.5. Panel co-integration test

The study adopted the techniques of Kao Residual Cointegration Test and Pedroni Residual Cointegration Test. The Cointegration tests results confirm the existence of a long-run relationship among the variables as revealed by their probabilities.

Table 4.4A. *Pedroni Residual Cointegration Test*

Series: RGDP GPOP GXEDU GXH HK IYR LABF

Null Hypothesis: No Cointegration

Trend assumption: Deterministic intercept and trend

Alternative hypothesis: common AR coefs. (within-dimension)				
			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	-4.342167	1.0000	-3.665938	0.9999
Panel rho-Statistic	3.592080	0.9998	3.734171	0.9999
Panel PP-Statistic	-23.65977	0.0000	-16.96571	0.0000
Panel ADF-Statistic	-11.09305	0.0000	-5.516254	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	4.584744	1.0000		
Group PP-Statistic	-19.15314	0.0000		
Group ADF-Statistic	-4.575116	0.0000		

Source: Author's Computation using Eview 8.0

Table 4.4B. *Kao Residual Cointegration Test*

Series: RGDP GPOP GXEDU GXH IYR LABF

Null Hypothesis: No Cointegration

Trend assumption: No deterministic trend

	t-Statistic	Prob.
ADF	-3.87129	0.0001
Residual variance	8.57E+18	
HAC variance	6.27E+18	

Source: Author's Computation using Eview 8.0

4.6. Analysis of the relationship between human capital development and economic growth in WAMZ countries

The task of instituting a functional link between economic growth and its long run determinants (population growth rate, government expenditure on education, government expenditure on health, human capital, investment-income ratio and labour force) in WAMZ countries was carried out using the panel data procedure. The panel estimation results for the WAMZ countries are shown in Table 4.5. The findings are stated for both fixed and random effects models.

4.7. Panel least square estimation (Fixed effects and random effects models)

The Hausman specification test shown in the lower section of Table 4.5 rejects the random effects model in preference for the fixed effects model. The conclusion drawn from the Hausman test is that the fixed effects model is preferred to the random effects model.

From the fixed effects panel least-square estimation results, the coefficient of human capital is statistically significant (at 1% significance level) and exhibits the expected theoretical sign in the fixed effects model. Specifically, the result implies that 1percent increase in human capital in WAMZ countries will lead to a rise in their economies by 0.3 percent.

The coefficient of government expenditure on education (0.065) is positive and statistically significant (at 1% significance level) in the fixed-effects model. This conforms to our a priori expected outcome. Thus, the result implies that, an increase in government expenditure on education by 1 percent will cause the level of economic expansion of the WAMZ countries to rise by 0.07 percent.

The coefficient of determination (R^2) indicated that, about 99 percent of the systematic variations in the explained variable (economic growth) is accounted for by the combined effect of the explanatory variables in the estimated model, while the remaining 1 percent is due to the influence of other variables captured by the stochastic disturbance term. From the result also, the F-statistic indicates that, the independent variables are simultaneously significant when addressing issues relating to the determinants of economic expansion in the WAMZ countries. The empirical results from the panel data estimations are reported in the table below.

Table 4.5. *Panel data estimation results*
Dependent Variable: LOG (RGDP)
Method: Panel EGLS (Cross-section SUR)

Variables	Fixed Effect Model			Random Effect Model		
	Coefficient	t-stats	Prob.	Coefficient	t-stats	Prob.
LOG(GPOP)	0.0904	3.45	0.001***	-	-	-
LOG(GXEDU)	0.065	3.80	0.000***	-14.31	-298.66	0.0000
LOG(GXH)	-0.009	-0.79	0.433	-2.48	-106.05	0.0000
LOG(HK)	0.304	6.67	0.000***	2.25	36.79	0.0000
LOG(IYR)	-0.022	-2.05	0.045***	0.06	2.12	0.0374
LOG(LABF)	0.668	6.84	0.000***	5.95	345.07	0.0000
C	2.846	2.19	0.032***	-62.60	-176.72	0.0000
No. of Observation	72			72		
R-Square	0.99			0.53		
Adjusted R-Square	0.99			0.49		
F-Statistics (prob)	417932 (0.00***)			15.12 (0.00)		
Hausman Test	Chi-square statistic (5) = 147029.94 (0.00***)					
Durbin-Watson stat	1.74			0.50		

Note: NB: *** indicates Significant at 1%.
Source: Author's Computation using E-view 10.0

4.8. Policy implications of findings

From the estimation results above, the variables (population growth rate, government expenditure on education, human capital and labour force)

were found to be of huge significance in determining economic growth as indicated by their corresponding t-ratios. The implication for the WAMZ countries is that, for a desired level of economic progress to be achieved in these countries, due recognition must be given to these macroeconomic fundamentals captured in the study. In other words, the policy implication of this is the need to adopt strategic measures to enhance the level of human capital formation and development in the WAMZ countries; as such efforts would yield the right quantum of outputs growth in the WAMZ economies.

5. Conclusion and recommendation

As one of the factors of human capital development, government expenditure on education was found to have a significantly positive effect on the level of growth of most WAMZ countries. In the light of this, government should increase their budgetary allocation to education and ensure efficient implementation of relevant policies that will help improve on the economy.

Government expenditure on health was found to have an insignificant effect on the economy. This can be arrested if Governments of WAMZ countries scale up their health sector budget, ensure efficient implementation of policies that will improve health infrastructure as well as personnel to enhance health services delivery that will promote economic growth.

In the WAMZ countries however, the issue of whether these variables (population growth rate, government expenditure on education, government expenditure on health, human capital, investment income ratio and labour force) influence productivity appears to have been largely unheeded especially in the process of policy formulation. It is on this note that this study examined the the impact of human capital development on growth in WAMZ countries. Generally, growth in the WAMZ countries was found to be largely determined by factors like population growth rate, government expenditure on education and human capital. It follows therefore that, if the current frail attitude of policy makers in the WAMZ countries towards effective macroeconomic policy formulation is to be reversed, then due recognition should be accorded to these macroeconomic fundamentals employed in this study, in the conception, formulation and implementation of policies aimed at inducing long-run growth and stability in the WAMZ countries. The overall findings of this study inform the need to sturdily and unanimously conclude that, population growth rate, government expenditure on education, human capital and labour force collectively impact on growth in the WAMZ countries.

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