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AN EMPIRICAL INVESTIGATION INTO THE KEY DRIVERS OF ECONOMIC PERFORMANCE IN THE CEMAC ZONE: A PANEL CORRECTED STANDARD ERRORS APPROACH

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ABSTRACT

The economic performance of CEMAC countries is severely poor, when compared to other communities of the same region. It is on the bases of this background, that this paper purports to empirically investigate the potential key drivers of economic performance in the CEMAC zone. Specifically, the study attempts to scrutinise the effect of: (a) educational expenditure, (b) gross physical capital formation, (c) public health expenditures, and (d) private health expenditure on economic performance. To ascertain these objectives, data is sourced from the World Bank Development Indicators (WDI) of 2017 and used is made of both descriptive and inferential statistics. The Panel-corrected standard errors (PCSE) regression model was employed to test the objectives, due to its capacity to produce appropriate standard error estimates with very insignificant loss of efficiency. The empirical findings, among others suggested that, all forms of investments included in the model, significantly influenced the economic performance of countries in the CEMAC sub-region. Specifically, the results showed that educational expenditure and gross physical capital formation positively influence economic performance in the CEMAC zone. Intriguingly, public and private health expenditures negatively influence economic performance in the said zone. The policy implications of these findings suggest that, emphasis should be laid on increasing investment on government's educational expenditure and gross physical capital formation in the CEMAC zone, if economic performance must be revived.

Contribution/Originality: This study uses panel corrected standard errors approach, to scrutinize the causal relationship between the CEMAC economic performance and variables like educational expenditure, gross physical capital formation and public and private health expenditures.

1. INTRODUCTION

With the incessant depreciation of physical capital investment, human capital investments are gaining ground in the modern-day economics literature. According to Edielle (2005) investment in human capital has not been of any importance before the 1960s as people were considered as machines. Previously to this date, the concept of capital was limited only to physical capital while expenditures on health and education were regarded as consumption and not investments. In this light, several researchers became bothered as this old-fashioned approach could not explain the rapid economic growth rate observed in most developed countries in the likeness of USA.

This orthodox approach of viewing capital became a puzzle to many researchers in general and economists in particular, due to it ineffective elucidation of the high growth rates registered in some countries. In was, in this light that Odusola (1998) in other to scrutinised the source of the growth rate in physical capital discovered a "lingering" output that was unexplained by the pioneers of the exogenous growth models.

Nonetheless, some economists in the pass, like Adam Smith had revealed that human capital has a substantial contribution to production (Smith, 1776) but did not call it human capital. It was in this light that Bloom *et al.* (1998) as cited in Hamoudi and Sachs (1999) considered a variable that was related to heath in their empirical evidence on the relationship between health and economic growth. The study revealed that health outcome play a very significant role in determining economic growth rates.

The creation of any form of regional community or trade bloc has as central objective, the improvement of both trade and economic performance. The Central African Economic and Monetary union (CEMAC) which was formed in 1994, to replace the previous Customs and Economic Union of Central African States (UDEAC) formed 1984 has as common feature the sharing of the same currency, referred to as the franc CFA *(Coopération Financière Afrique Centrale)*. This Union hence, has a common monetary policy. The CEMAC zone is one of the few trade blocs that raises a lot of economic worries as the gross domestic product per capita for the six member countries has remain law since its creation (Brown-Robertson *et al.*, 2015) and the intra trade within the zone has remain insignificant.

The six countries that make up the CEMAC zone are: Central Africa Republic, Cameroon, Equatorial Guinea, Gabon, Republic of Congo, and Chad. CEMAC represents a potential market of about 42.5 million people spread over more than 3 million km2, endowed with enormous natural resources. Intriguingly, approximately half of the 42.5 million, lives in Cameroon. Cameroon alone contributes about 28.6% of regional GDP. Due to it climatic diversity and the availability of enormous agricultural land, the CEMAC region is particularly suited for the development of agro-pastoral activities. Deposits of oil, natural gas, gold, diamonds, manganese and uranium are among some of the mineral wealth found in this zone. There is undisputable fact that this zone is rich in natural resources.

Due to the inadequate private investment, little or no exploitation of most of the natural resources, with the exception of oil and timber has be observed. Excepting Central African Republic (CAR) where crude petroleum is an important resource for the CEMAC countries and accounts for 86% of Community exports, the rest of the countries are not yet sufficiently exploiting this product. Congo depends on this for 61% of its GDP, Chad for 40%, Gabon for half and Cameroon for about 10%. In addition, timber forms the second largest export product in the Community and with the exception Chad, the rest of the countries derive substantial export earnings from it. Imports are dominated by manufactured goods and come mainly from Europe, Africa and Asia. From the reviewed facts and statistics, on the enormous resource available within the CEMAC, one should expect gross domestic product per capita to be high when compared to other regions. Paradoxically, it has remains at a very low level and even the lowest in Africa. This is a dramatic situation and a call for concern.

According to World Development Indicators (2014) the human capital investment have remained low overtime in the CEMAC countries. For example, health expenditure for Cameroon stood at 5.1% 4,9%, 3,6%, 3,9%, 5,1% 4,6%, 5,1%, 4,9% and 5,6%, for the years 1980, 1985, 1990, 1995, 1996, 2000, 2002, 2005 and 2009 respectively (WDI, 2014). This is suggestive of the fact that, health expenditure as a percentage of GDP has remained low in Cameroon overtime. The orientations of the national health policies aims at attaining the sustainable development goals (SDG) and the goals that are indicated in the growth and employment strategy paper (GESP). From 1991/92 to 1996/97, public expenditures towards the health sector represented about 3.0% of the national budget. In 1997/98 it increased to about 7%. Paradoxically, this increase was not transformed in an increase in the expenditures on primary health care per head, which passed from 1164MFCFA in 1991/92 to 491MFCFA in 1995/96. The low health expenditure explains the deteriorating in some health indicators as revealed by the findings on demographic inquiry that compares health expenditures from 1991 to 1998. The ministry of health

budget increased from 83.7 billion in 2008 to 113.3 in 2009 representing 4.9% of the state budget. Despite the assistances received by this sector from external funding public expenditures still remain low in this sector in Cameroon.

As concern educational expenditure, it percentage has also remained significantly low. As educational expenditure (% of GDP) in Cameroon stood at 2.6%, 3.1%, 3,1%, 2.5% 2.1%, 1.9%, 3.9%, 3.1% and 3.7% for the years 1980, 1985, 1990, 1995, 1996, 2000, 2002, 2005 and 2009 respectively according to WDI (2014). The advent of liberalisation, let to the creation of numerous private educational institutions. In effect, 250 private higher educational institutions as of 2011 are registered in Cameroon. Moreover, while University tuition was free before the 1990's, after this era students were call upon to start paying tuition which sum up to 50,000FCFA. The result of this change saw private individuals contributing in financing their education. The educational system in Cameroon is typically characterised by both very low internal rates of returns on one hand and significant high rates of dropouts in general and most especially within the francophone sub- system of education.

As indicated in the growth and employment strategy paper (GESP) the social policy of Cameroon concerns: promoting gender equality and women's empowerment, improving the health of the population, indorsing universal education, social protection of children and marginalised persons, promoting youth empowerment and low cost housing. As concern education, the objectives are to: improve the efficiency and quality of the educational system by easing access to educational, maintain the system while correcting disparities, develop efficient partnership with the different stakeholders and finally, improve the management and governance of the educational system. In 2009, resources allocated to this sector represented 17.5% of the state budget which indicate an increase from the 12.5% in the previous years (INS, 2008). Unfortunately, this increase is concentrated in the payment of personnel with very little to infrastructural development.

At the same time, statistics from the WDI (2014) revealed that physical capital formation in GDP stood at US$ 20.98284, 24,88495, 17,81198, 13,29648, 14,24026,19,78918, 19,0683 and 20,89731 for the years 1980, 1985, 1990, 1995, 1996, 2000, 2002 2005,and 2009 respectively. This shows that physical capital formation constitutes quite a portion of GDP performance in Cameroon.

Cameroon at the same time, has not registered good performance as it growth rate has been staggering at a rate considered unacceptable. For instance, GDP Growth annual (%) for Cameroon stood at 4.13% 4.17%, 2.3% and 3.27% for the year 1995 2000, 2005 and 2010 respectively (WDI, 2014). The percentage of budgetary expenditure on the health has been fluctuating around this poor performing growth rate of GDP. Following the presiding background, which suggest that CEMAC countries have been experiencing low human capital investments (health and education) and poor economic performance there is therefore an urgent need to determine the causes of this, and to identify the potential drivers of economic performance in the CEMAC zone. This paper therefore seeks to:

- Scrutinise the role of physical capital expenditures, educational expenditures, private health expenditures and public health expenditure on economic performance in the CEMAC zone.

The remaining part of this paper is organized as follows: section II reviews current and relevant literatures, section III presents the data description and estimation technique while section IV presents and discusses the findings. The results are summarize, policy prescriptions and conclusion are unfolded in section V.

2. LITERATURE REVIEW

Many studies have been conducted across the globe on the nexus between public investment be it physical or human (education and health) and economic performance. Some focused on health related issues while others duelled on education aspect and how it affect economic performance. Others have combine both education and health related issues in their empirical investigation.

For a long time, economics theory placed remarkable importance on physical capital accumulation as the most vital ingredient in diving economic performances. Empirically, this theories have not been fruitful due to the

continuous diminishing returns to physical capital and it incapacity in stimulating growth in general and household well-being in particular, according to Schultz (1961). It is in this light that the endogenous growth models will be developed by authors like Becker (1992), Romer (1986) and Lucas (1988). The importance of human capital as a key drive of economics performance has been stressed in the literature. For evidence see Behrman and Wolfe (1989); Behrman and Anil (1988) and the references therein.

Following the premises of some of the theories mentioned above, Immink and Viteri (1981) using data sourced from the INCAP nutritional supplementation project, will compare the increments in harvests using two similar groups of Gatemalan sugar cane workers. In this case, group one was administered high energy supplement and group two a smaller proportion. The empirical findings revealed that productivity increased in both groups during the period of supplementation, but that there was scarcely any difference between the productivity gains for both groups. The implication of this finding suggest that, the additional energy expenditure dissipated on other activities other than work. Contrary to Immink and Viteri (1981), Wolgemuth *et al.* (1982) regress gains in labour productivity in Kenyan road construction on total calorie intake and the findings revealed a large positive effect of calories. While this studies conceptualise human capital from health's perspectives since they focused on food intake, other will focus on education.

As concern the human capital captured from the perspective of education, Barro (1991) using a cross sections of countries will investigate the effect of human capital on economic performance. Educational human capital captured as school enrolment rates at the primary and secondary level was found to be vital for economic performance. Newland (1996) also use several measures as indicators of human capital such as physical strength and skills and the findings collaborated those of Barro (1991). These studies can be criticize for considering only one component of human capital. Others studies in other to avoid this limit, have explicitly considered other components.

It is in this light that (Ramirez *et al.*, 1997) will considered both public expenditure on health and on education in their cross country empirical study. The study among others indicated that both health and education expenditure are vital for economic growth. Bloom *et al.* (1998) as cited in Hamoudi and Sachs (1999) provided empirical evidence on the relationship between health and education variables and economic growth rates. Using a cross country survey with data running from 1965 to 1990, they found that health significantly affected economic performance positively. In effect, they found that an increase of life expectancy by one percent as a result of investing in health accounted for an acceleration of GDP per capita growth by over 3% per annum.

Using integration and error-correction mechanisms, Adamu (2003) undertook an empirical investigation to determine the impact of human capital formation on economic growth in Nigeria between 1970 and 2000. The findings indicated that investment in human capital captured as education and training will definitely stimulate economic performance due to its impact on labour productivity.

In 2003, Chete and Adeoya (2001) sort to explore the association between human capital investment and economic growth in Nigeria while displaying a set of methodological approaches. While the granger causality assessment were inconclusive on the direction of causality, the variance decomposition approach indicated that "own shocks" constituted the principal source of discrepancy in employment growth's forecast errors, and that innovations of employment growth could be a driver of income growth.

Mehmet and Sevgi (2014) interested in investigating the effect of education expenditure on economic growth in the Turkish economy during the period 1970-2012 and with the use of the Autoregressive Distributed Lag (ARDL) models reveled the existence of a positive and significant causal relation. In the same light, and using balanced panel data from 1973 to 2012 for 14 countries from Asia, Lingaraj et al. (2016) indicated the existence of a statistical positive and significant effect of educational expenditure on economic performance for all the 14 countries considered. In the same year, Sefa *et al.* (2017) thanks to the use of the meta-regression analysis revealed empirically that educational and health expenditure had deferent effect on economic performance. In effect, and according to

this study, it was revealed that while the effect was positive and statistically significant for educational expenditure, it was on the contrary negative and statistically significate for health expenditure.

Further, in 2017, the African Capacity Building Foundation was interested in studying the effect of gross government debt, gross final consumption expenditure and secondary school enrollment on economic performance captured by the annual GDP growth rate for country. Thanks to the use of the dynamic panel system GMM technique, they found out that all these variables negatively and significantly affected economic performance. This study however capture education while making use of gross enrollment and not gross expenditure on education as the present study purport to. In addition, and as concern the CEMAC zone, Mandiefe and Chupezi (2017) using data from the World Development Indicators (WDI) of 2016 and with the aids of the panel ordinary least square (OLS), found out that for all the sample considered, educational expenditure significantly and positively affected economic performance in the CEMAC zone. Our study do not only make use of additional variables neglected by Mandiefe and Chupezi (2017) study, but uses a recent WDI data set and an appropriate methodology from the views of Beck and Katz (1995).

An examination of this literature reveals gaps which this work sought to cover. Apart from the scanty literature about CEMAC relating to the topic under investigation, there has been no work to the best of our knowledge investigating the relative importance of both health and education, together with physical capital while trying to scrutinise it nexus with economic performance in the CEMAC zone.

3. DATA DESCRIPTION AND ESTIMATION TECHNIQUE

This paper covers the period from 1995 to 2016. The choice of this time frame is contingent on the fact that several economic reforms took place in the countries within the period with respect to promoting economic performance and human capital investments.The paper makes use of secondary data sourced from the World Bank (2017) for CEMAC.

The first model specification in this paper is a variant of the AK model, where there are two types of capital, physical and human capital modified to incorporate some important variables that affect the economic performance of CEMAC. It is assumed that these two forms of capital are produced with the same technology. In this light the total output of the economy is therefore specified as a general functional relationship of the form:

$$Q_{ti} = F(K_{ti}, H_{ti}) = F(K_{ti}, h_{ti} L_{ti}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where, F is a neoclassical production function, K_t the aggregate capital in period t, h_t the human capital per worker, and $H_t = h_t L_t$ is the effective labour.

Following the Cobb-Douglas specification, this general functional relationship is stated as follows:

$$Q_{ti} = A_{ti} L_{ti}^{\alpha} K_{ti}^{\beta} h_{ti}^{\gamma} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where: A is the level of technology, L is labour input, K is capital input, α, β and γ are elasticities of production with respect to labour, capital and human capital respectively. Gross domestic product per capita (GDPK) is the total output (Q), physical capital expenditures (GFKF) is the capital input(K), educational expenditures (GEDE) is the labour input (L) and private health expenditures (PRHE) and public health expenditure(PUHE) is the human capital input (h). This can therefore be specified in the functional relationship as follows:

$$GDPK_{ti} = A_{ti}(GFKF_{ti}^{\alpha}, GEDE_{ti}^{\beta}, PRHE_{ti}^{\gamma}, PUHE_{ti}^{\delta}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Linearizing this functional relationship and taking care of the error term (μ), the relationship is econometrically stated as:

$$InGDPK_{ti} = InA_{ti} + \alpha InGFKF_{ti} + \beta InGEDE_{ti} + \gamma InPRHE_{ti} + \delta InPUHE_{ti} + \mu_{ti} .. (4)$$

Let $InA_{ti} = \partial$ then;

$$InGDPK_{ti} = \partial + \alpha InGFKF_{ti} + \beta InGEDE_{ti} + \gamma InPRHE_{ti} + \delta InPUHE_{ti} + \mu_{ti} \dots\dots (5)$$

In the above equation, ∂, α, β, ϒ and δ are the coefficients to be estimated. The a priori expectations of this functional relationship are such that: $\partial \neq 0$, α>0, β>0, ϒ>0 and δ>0.

To integrate the active nature of economic performance due to the active nature of human capital investments, the estimation technique adopted for this panel study is the ***linear regression, correlated panels corrected standard errors (PCSEs)*** approach developed by Beck and Katz (1995).

Panel data are regarded as having repeated observations over time on some set of units, in our case CEMAC countries. They typically exhibit both contemporaneous correlation through units and unit level heteroskedasity hence making inference from the standard errors produced by the ordinary least squares (OLS) inappropriate. In this light, and to avoid this loophole, Beck and Katz (1995) developed a sandwich type estimator of the covariance matrix of the estimated parameters, which they called *panel-corrected standard errors (PCSE)*, which is robust as concern the possibility of non-spherical errors. The advantaged of the PCSE is that it account for these deviations from spherical errors and further permit appropriate inference from linear models estimated from Panel data. We opt for the PCSE in this study than the FGLS because the latter as indicated by Beck and Katz (1995) yields coefficient standard errors that are rigorously underestimated. In addition, and following Monte Carlo the former yields good standard error estimates with very insignificant loss of efficiency when compared to the standard FGLS. This technique has become common in empirical studies in the social sciences.

The suitability of the above parameters is tested on the basis of three criteria namely: the economic or *a priori* criteria, the statistical or first order test and the econometric or second order test. The economic or a priori test is concerned with the magnitude (size) and direction (sign) of the estimated parameters. Through this criterion, economic theories on the variables and their relationship are made to confirm to the expected signs and sizes of the parameters in question with respect to a priori expectation.

Consequently, the signs and magnitudes of the parameters are studied in agreement with the *a priori* expectations. Accordingly, the *Levin-Lin-Chu* and *Im-Pesaran-Shin* unit root tests are adapted to test for stationary of variables.

4. PRESENTATION AND DISCUSSION OF EMPIRICAL FINDINGS

The basic statistics examined hear are essentially the mean, standard deviations, maximum and minimum value of the variables of interest. Table 4.1 below summarizes the basic statistics of the variables of interest in the paper.

As shown by the statistics on table 4.1 below, the average GDPK in USD for the period of study has been 7.630073 billion USD deviating from this mean by 1.283896 billion USD for the 6 countries under study, the deviation between the 6 countries of CEMAC is 1.339233 billion USD while the deviation within each CEMAC country is 0.3773039 billion USD. At the same time, the maximum value for GDPK is 9.920047 billion USD and

the minimum value is 5.70538 billion USD for the 6 countries under study, the maximum value and minimum value between the 6 countries of CEMAC is 9.191639 billion USD and 6.000137 billion USD respectively. At the same time, the maximum value and minimum value within each CEMAC country is 8.40172 billion USD and 5.252 billion USD respectively.

In addition, the average GEDE in USD for the period of study is 0.8687706 billion deviating from this mean by 0.398999 billion USD for the 6 countries under study. The deviation between the 6 countries of CEMAC is 0.2495114 billion USD while the deviation within each CEMAC country is 0.3269927 billion USD. All at once, the maximum value for GEDE is 1.827431 billion USD and a minimum value of -0.6893927 billion USD for the 6 countries under study. The maximum value and minimum value between the 6 countries of CEMAC is 1.163481billion USD and 0.4616724 billion USD respectively. Together, the maximum value and minimum value within each CEMAC country is 1.823341billion USD and 0.6934819 billion USD respectively.

At one fell swoop, the average PRHE in USD for the period of study is 0.5377105 billion deviating from this mean by 0.5661606 billion for the 6 countries under study, the deviation between the 6 countries of CEMAC is 0.5502202 billion USD while that deviation within each CEMAC country is 0.2575398 billion USD. In unison, the maximum value for PRHE is 1.729997 billion USD and a minimum value of-0.8039482 billion USD for the 6 countries under study, and the maximum value and minimum value between the 6 countries of CEMAC is 1.250526 billion USD and-0.2108784billion USD respectively. Simultaneously, the maximum value and minimum value within each CEMAC country is 1.339795 billion USD and -0.0553592billion USD respectively.

Table-4.1. Summary Statistics

Variables		Mean	Std. Dev	Min	Max	Observations
LGDPK	Overall	7.630073	1.283896	5.70538	9.920047	N = 132
	Between		1.339233	6.000137	9.191639	n = 6
	Within		0.3773039	5.252	8.40172	T = 22
LGEDE	Overall	0.8687706	0.398999	-0.6893927	1.827431	N = 132
	Between		0.2495114	0.4616724	1.163481	n = 6
	Within		0.3269927	-0.6934819	1.823341	T = 22
LPRHED	Overall	0.5377105	0 .5661606	-0.8039482	1.729997	N = 132
	Between		0.5502202	-0.2108784	1.250526	n = 6
	Within		0.2575398	-0.0553592	1.339795	T = 22
LPUHE	Overall	0.5261994	0.4070448	-0.2425435	1.686566	N = 132
	Between		0.2593128	0.0442533	0.788641	n = 6
	Within		0.3304871	-0.3523859	1.550126	T = 22
LGFKF	Overall	3.177019	0.6644391	1.857046	5.389389	N = 132
	Between		0.567161	2.356358	4.086499	n = 6
	Within		0.4139728	1.415531	4.479909	T = 22

Source: Author's computation based on WDI 2017

Within the same period and for the same individuals, the average PUHE in USD is 0.5261994 billion USD deviating from this mean by 0.4070448 billion for the 6 countries under study, the deviation between the 6 countries of CEMAC is 0.2593128 billion, while that deviation within each CEMAC country is 0.3304871 billion. At the same time and space, the maximum value for PUHE is 1.686566 billion USD and a minimum value of -0.2425435billion USD for the 6 countries under study, and the maximum value and minimum value between the 6 countries of CEMAC is 0.788641 billion USD and 0.0442533 billion USD respectively. At the same time and across the 6 countries, the maximum value and minimum value within each CEMAC country is 1.550126 billion USD and 0.3523859 billion USD respectively.

As concern the GFKF, the average GFKF in USD is 3.177019 billion deviating from this mean by 0.6644391 billion for the 6 countries under study and the deviation between the 6 countries of CEMAC is 0.567161 billion while that deviation within each CEMAC country is 0.4139728 billion. In addition, the maximum value for GFKF is 5.389389 billion USD and the minimum value is 1.857046 billion USD for the 6 countries under study. The

maximum value and minimum value between the 6 countries of CEMAC is 4.086499 billion USD and 2.356358 billion USD respectively. Together, the maximum value and minimum value within each CEMAC country is revealed as 4.479909billion USD and 1.415531 billion USD respectively.

This correlation matrix below is intended to establish the relationship between the variables under study.

Table-4.2. Correlation Matrix Results

Variables	Gross Domestic Product per capita	Gross Educational Expenditure	Private Health Expenditure	Public Health Expenditure	Gross Fixed Capital Formation
Gross Domestic Product per capita	1.0000				
Gross Educational Expenditure	0.5699***	1.0000			
Private Health Expenditure	-0.6553***	-0.1143	1.0000		
Public Health Expenditure	0.1124	-0.1431	-0.4152 ***		
Gross Fixed Capital Formation	0.5006***	0.1685 *	-0.4761 ***	0.8872***	1.0000

Note: *, **, and *** represents probability values 10%, 5% and 1% level of significant respectively.

The correlation results above show that there exist a positive and significant relationship between GEDE and GFKF. Worth noting from the results is that, PRHE is negatively and strongly correlated with GDPK. Also, PUHE is positively and weakly correlated with GDPK but negatively and weakly correlated with GEDE and PRHE in the CEMAC zone. Result from the correlation analysis are however limited since causality related issues cannot be insinuated.

Non-stationary time-series data amount to a deep-seated problem in economic analysis. A non-stationary time series data may become stationary after differencing a number of times until stationarity is achieved. This may involve taking the lag values of the non-stationary variable through differencing to render it stationary.

Table-4.3. Unit Root Test Results

	Levin-Lin-ChuUnit Root Test				Implied Order of Integration
	Levels		First Difference		
Variables	Unadjusted t Adjusted t* (Statistic)	P-value	Unadjusted t Adjusted t* (Statistic)	P-value	
LGDPK	-8.8911 -6.8488	0.0295			I(0)
LGEDE	-5.0660 -3.0955	0.0070			I(0)
LPRHE	-2.6656 0.4020	0.6562	-5.0005 -2.5752	0.0050	I(1)
LPUHE	-3.0110 0.6211	0.7327	-4.5524 -1.7524	0.0398	I(1)
LGFKF	-5.7016 -1.3336	0.0912	-5.5625 -1.5410	0.0617	I(1)
	Im-Pesaran-ShinUnit Root Test				
	W-t-bar (Statistic)	P-value	W-t-bar (Statistic)	P-value	
LGDPK	-0.1931	0.4234	-3.6047	0.0002	I(1)
LGEDE	-1.6870	0.0458			I(0)
LPRHE	-0.8207	0.2059	-4.1253	0.0000	I(1)
LPUHE	-0.1060	0.4578	-1.3659	0.0860	I(1)
LGFKF	0.2571	0.6015	-1.8446	0.0484	I(1)

Source: Author's computation based on WDI 2017

The decision rule for the existence of unit root problem will lie on a hypothetical premises that:

If the Mackinnon p-value for z(t) is greater than 10% then there exist a unit root problem: Therefore our null hypothesis is

Ho: Panels contain unit roots

In this study the results from the Levin-Lin-ChuUnit Root Test and Im-Pesaran-ShinUnit Root Test conducted in this respect are as presented on the table above.

The Levin-Lin-ChuUnit Root Test results above show that, all the variables are stationary with LGDPK, LGEDE and GFKF being stationary at level while PRHE and PUHE are stationary after first difference. On the basis of this, we reject our null hypothesis that Panels contain unit roots and conclude that the Panels are stationary. Also, the Im-Pesaran-ShinUnit Root Test results above show that, all the variables are stationary after first difference with only LGEDE being stationary at level while LGDPK, PRHE, GFKF and PUHE are stationary after first difference. On the basis of this, we reject our null hypothesis that all panels contain unit roots and conclude that some panels are stationary. This indicates that our variables can be used for further regression or estimations.

Table-4.4. Linear Regression, Correlated Panels Corrected Standard Errors (PCSEs) Results

LGDPK	**Coefficient**	**Std. Err.**	**z-Statistic**	**P>|z|**
LEDE	0.9881074***	0.2229099	4.43	0.000
LPRHED	-1.465319***	0.1425074	-10.28	0.000
LPUHE	-0.4527101**	0.2068823	-2.19	0.029
LGFKF	0.3468204***	0.1232258	2.81	0.005
_cons	6.695913***	0.4389784	15.25	0.000
Number of observations	132			
Number of groups	6			
R-squared	0.6059			
Wald chi2(4)	176.24			
Prob> chi2	0.0000			
Estimated covariances	21			
Estimated autocorrelations	0			

Note: *, **, and *** represents probability values 10%, 5% and 1% level of significant respectively. From the above results, the relationship between the variables under study can be specified as follows:

$$InGDPK_{ti} = 6.69 + 0.35InGFKF_{ti} + 0.98InGEDE_{ti} - 1.46InPRHE_{ti} - 0.45InPUHE_{ti} + \mu_{ti} \ldots\ldots (6)$$

The empirical findings presented above indicates that all forms of investments included in this model significantly influence the economic performance in the CEMAC sub-region implying that changes in all these forms of investments is likely to change economic performance in the CEMAC sub-region. Specifically, the coefficient of the elasticity of gross educational expenditure has a positive effect on economic performance in the CEMAC. As shown by its coefficient, doubling the level of gross educational expenditure in CEMAC would lead to approximately 99% increase in the GDPK of CEMAC. This is as expected and also significant at 1% level of significance. The finding is not in line with the empirical findings of Amin and Awung (2005). This may be so because of reformations that has taken place in the CEMAC sub-region in the recent years. Contrary to the claim of Amin and Awung (2005) there has been a remarkable increase in the level of professionalization of education in CEMAC in the recent years and more resources are devoted to primary, secondary and tertiary education sectors. Growth models emphasizing capital accumulation such as the AK model hold that, higher capital investment should foster GDPK. As such, the more the creation of investment, production, and employment in CEMAC, the greater will be the rate of national income (GDP).

Intriguingly, the coefficient of private health expenditure is negative and significant, implying that increments in private health expenditure have the potentials of decreasing economic performance in CEMAC. Based on the

results, a 100% increase in the level of private health expenditure has the ability to decrease economic performance in CEMAC by approximately 150% which is not in accordance with the positive expectations. The empirical findings are further estimated to be statistically significant at 1% level of significance. The finding is not in consonance with the findings of Bloom *et al.* (1998) as cited in Hamoudi and Sachs (1999) providing empirical evidence on the relationship between health variables and economic growth rates by investigating cross- country data between 1965 and 1990, using a basic growth model. This is not also in line with the human capital theory by Kuznets (1973) who made known that a healthy an active population will increase the rate of economic performance. The theory postulates that an increase in government expenditure on health implies that output will increase since very few hours will be lost as a result of ill health. This is as cited in Jhingan (2005). Despite the findings are not in collaboration with those of Bloom *et al.* (1998) they are nevertheless corroborated to the result from Sefa *et al.* (2017).

The coefficient of public expenditure on health is negative and significant. The result shows that a 1% increase in public expenditure on health will lead to an increase in GDPK by approximately 45%, other things being equal. This means that there exists an indirect relationship between GDPK and public expenditure on health. This is not in conformity with the economic a priori expectation but statistically significant at the 5% level of significance. The finding is not in consonance with the findings of Ramirez *et al.* (1997) who explored two way linkages between economic growth and human development empirically with the help of cross country statistics.

The assumption of gross domestic product per capita (GDPK) is that the wealth has been equitably distributed, such paradoxical coefficients of both private health expenditure (PRHE) and public health expenditure (PUHE) is likely due to the problem of inequality in most African countries. That is, such paradoxical coefficients of both private health expenditure (PRHE) and public health expenditure (PUHE) are likely due to the fact that in most African countries and CEMAC countries in particular, most of the sophisticated investments in health are concerntrated at metropolitan cities far from the grass road population. In addition, even in the cities, only a few citizens referred to as the bourgeoisie have access to this sophisticated health related instruments.

Supplementary, such contradictory coefficients of both private health expenditure (PRHE) and public health expenditure (PUHE) are likely due to the fact that in most African countries and CEMAC countries in particular, the grass road population do not have access to good health facilities because this sophisticated health facilities are absent in the peripheries. As a result, the masses therefore find themselves feinting for other means of increasing their health status through modern traditional doctors which are rapidly growing in the African continent. This findings can hence be supported by the high inequalities in the African continent and in the CEMAC zone.

The result further reveals a positive and significant coefficient for gross fixed capital formation. This shows that a positive change in gross fixed capital formation will induce a positive effect on economic performance in CEMAC. Precisely, the result shows that a 1% increases in gross fixed capital formation will lead to an increase economic performance in the CEMAC zone by 35%. This is in line with our economic a priori expectation that there exist a positive relationship between economic performance and gross fixed capital formation. This finding is statistically significant at the 1% level of significance.

However, the coefficient of multiple determination shows that approximately 61% of the variation in economic performance of CEMAC can be attributed to the joint variation in the shortlisted investments (gross educational expenditure, private health expenditure, public health expenditure and gross fixed capital formation) with the remainder 39% of variation accounted for by other economic performance related factors not included in the present model. The overall significance of this results are rendered plausible by the high value of the Wald chi2 acting as the F-ratio in this case and its probability assessment whose 0.0000 value indicates that the empirical results are 99% reliable for policy prescriptions.

5. CONCLUSION AND POLICY IMPLICATIONS

The study has shown that gross educational expenditure, private expenditure on health, public expenditure on health and gross fixed capital formation, all significantly affect economic performance in the CEMAC zone. Based on this, the following policy recommendations are made.

The policy implication of the findings is that the governments should place a high priority on the development of the health sector in every locality in order to solve the problem of inequality in the health sector in the CEMAC region. Measures such as training of health personnel, construction of clinics in the peripheries, hospitals and other health facilities should be encouraged so as to increase the quantity and quality of life years of workers.

In the sphere of influence of education, gross expenditure on education has been found in this paper to be a veritable means to improve economic performance in the CEMAC zone. It is therefore strongly recommended, based on these findings that CEMAC governments should go in for more professionalization of the educational system so as to match-made education to existing jobs as well as existing physical capital. In this light, CEMAC governments should develop the formation through the learning of trades. Here, professional institutions permitting youths to learn trades should be encouraged. The tertiary sector should be improved upon in the CEMAC region. These schools should form partnerships with enterprises so as to imbue students with the realities of the professional life. This will likely help in reducing underemployment and brain drain.

Human and institutional capacities of the school system should be reinforced. In order words, educative infrastructure should be constructed and modern teaching technology encouraged. The formation and recycling of teachers is of paramount importance and teachers should be recruited on the basis of objective criteria and from all parts of the national territory to enhance efficiency. This implies that teacher training programs at primary and secondary level should be reinforced and be developed to attract very good candidates.

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