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Health and Growth in CEMAC Countries: An Empirical Analysis

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Abstract

In this article, we sought to verify the impact of health on economic growth in the CEMAC zone, using life expectancy at birth as a variable of interest. We chose to use the dynamic panel generalized moments method because it provides solutions to the problems of simultaneity bias, reverse causality and omitted variables. The results show that life expectancy at birth positively explains economic growth in CEMAC countries. One of our control variables, the death rate, is significant but does not have the expected sign. Increased mortality promotes economic growth. This work establishes the mortality rate as a source of economic growth in the same way as FDI or the secondary school enrollment rate, among others.

Keywords

Life Expectancy at Birth, Public Health Expenditure, Secondary School Enrollment Rate, Mortality Rate, GMM, CEMAC

1. Introduction

Health care is a household consumption item, regardless of how it is financed. It is often perceived as a cost that must be "sustainable", i.e. financed over the long term. However, it is more than that: it is also an integral part of human capital, an expenditure that drives economic growth in the same way as education, an investment in which households and the state have a say.

During the period 1950-1980, the relationship between health status and growth was presented and analyzed in terms of growth leading to improved health: an increase in average income in an economy enables individuals and society to take better care of health problems and, consequently, growth improves the general state of health of the population (Ulmann, 1999). The aim of more recent macroeconomic research on the relationship between population health status and growth is to demonstrate that health status has a positive effect on the rate of growth, and that the relationship between health and growth should also be taken into consideration (Kocoglu & De Albuquerque David, 2009).

On a theoretical level, it has been proven that the health of populations influences economic growth and overall income. Like education, it is an essential condition for long-term growth. Endogenous growth models emphasize its role in human capital, in the quality of labor supply and in growth (Aghion et al., 2010; Kocoglu & De Albuquerque David, 2009). They are based on the idea that investment in people's health is not limited to individual interest, but is also profitable for the community through its external effects, from which companies and society in general benefit.

Moreover (Ulmann, 2009), health represents an investment in the future. The role of health is now widely accepted (Grossman, 1972), as is that of human capital in economic growth since Schultz (1961) and Becker (1964).

Since the mid-1980s, there has been a boom in research on economic growth, starting with the work of Romer (1986), Lucas (1988) and Barro (1990). The new theories of endogenous growth emphasized the productivity gains arising from technological advances and increases in human capital (in the form of education and health).

The results of empirical work on the supposed link between health and economic growth present studies on the effects of improved health status on growth rates, highlighting in particular the main findings on developing countries and those focusing more specifically on developed countries.

In this work, we will focus primarily on studies concerning developing countries. We will first present the studies that show a positive link between health and growth, followed by the rarer studies that highlight the existence of a negative link.

Health plays a fundamental role in improving population productivity, well-being and economic growth. Empirical studies on the impact of health on growth are based on a methodology that uses panel data from selected countries, and regresses the growth rate of GDP per capita on the initial level of health, and on variables assumed to influence the equilibrium (economic policy variables, institutional variables, education variables, etc.) (Diagne, 2007).

In most of these studies, life expectancy is used as a measure of health status.

Barro and Sala-í-Martin (1995) found that 5 more years of life expectancy increased the growth rate by 46%. They worked on the periods 1965-1975 and 1975-1985 and on 87 and 97 countries. They used life expectancy, public spending on health and education, as well as the rate of investment, political instability measured by the number of coups d'état and foreign trade.

Bloom and Malaney (1998) used a panel of 77 countries, over 25 years, using the simple linear regression method. They studied the impact of health on growth, and of variables relating to demographics (total population and active population growth rates), education (secondary school enrolment), natural resources, external openness and institutional variables. For health, they obtained a positive impact, with a 21% increase in the growth rate of the product, following a five-year increase in life expectancy.

Bloom and Malaney (1998), with different accompanying variables, obtained similar results, i.e., the positive effect of health variables on growth.

Reducing mortality through education, or as a direct result of education, reduces fertility and thus increases growth (De La Croix & Doepke, 2003).

Work by the WHO Commission on Macroeconomics and Health (CMH, 2001; WHO, 2001) indicates that estimates generally show that a 10% improvement in life expectancy is associated with an increase in economic growth of at least 0.3% to 0.4% per year.

Several other, more recent studies have sought to empirically clarify the link between health and economic growth. Some studies show a negative (Acemoglu and Johnson, 2007) or insignificant (McDonald et al., 2002; Hartwig, 2009) relationship between health and growth. Most studies generally conclude that there is a positive and significant impact from health to growth or vice versa, see for example: Weil (2005, 2007); Barro & Sala-I-Martin (1995); Gyimah-Brempong and Wilson (2004); Jamison et al. (2004); Aghion, Howitt and Murtin (2010); Kocoglu & De Albuquerque David (2009).

In this context, our article seeks to verify whether improving the health status of populations has an impact on growth in five countries in the CEMAC zone (Cameroon, Gabon, CAR, Congo and Chad). Equatorial Guinea was excluded from the study due to a statistical problem. The aim was to justify increasing resources in the health sector in the event of a positive relationship.

This article uses the method of generalized moments in a dynamic panel to study the link between health and economic growth in the CEMAC countries.

Faced with ever-increasing demands from other sectors of the economy, public authorities are finding it increasingly difficult to allocate more resources to the health sector. A scientific study corroborating the link between health and economic growth can still serve as a decision-making tool, and thus encourage an increase in resources in this sector, despite all the existing constraints. In addition, this work will help to expand the literature on health economics.

This article is divided into five parts. In the second part, we present the theoretical framework, in the third, the data and empirical methodology, and in the fourth, the empirical results of the regression performed. The fifth section concludes with a summary of our results and a few suggestions for future research.

2. The Theoretical Framework

We drew inspiration from the work of Suhrcke and Urban (2006). They wrote their model on panel data in the following general form:

$$y_{it} = \sum_{l=1}^{p} \alpha_l \cdot y_{i,t-l} + \beta_0 + \beta_1 \cdot x_{i,t-1} + \beta_2 \cdot z_{i,t-1} + \eta_i + \varepsilon_{it}$$

where: y_{it} : GDP per capita in period $t = 1, \cdots, T$;

$x_{i,t-1}$: vector of pre-determined control variables;

$z_{i,t-1}$: vector of exogenous control variables;

η_i : country-specific random i.i.d. effect;

ε_{it} : usual i.i.d. error term (possible heteroscedasticity)

$\beta_j \left(j = 0,1,2 \right)$ et $\alpha_l \left(l = 1, \cdots, p \right)$: regression coefficients with: $\left| \sum_{l=1}^{p} \alpha_l \right| \leq 1$

The use of the generalized method of moments in dynamic panels provides solutions to the problems of simultaneity bias, reverse causality and omitted variables. A dynamic model is one in which one or more lags of the dependent variable appear as explanatory variables. In contrast to dynamic panel GMMs, standard econometric techniques such as OLS do not provide efficient estimates of such a model, due to the presence of the lagged dependent variable on the right-hand side of the equation. Two tests are associated with the GMM estimator: the Sargan/Hansan over-identification test, which tests the validity of lagged variables as instruments. The Arellano Bond autocorrelation test, where the null hypothesis is the absence of second-order autocorrelation of the errors in the difference equation.

3. Data and Empirical Specification

3.1. The Data

The data used in this article concern five countries in the CEMAC sub-region, namely: Cameroon, Gabon, Republic of the Congo, Central African Republic (CAR), and Chad. They were collected for the period from 1970 to 2019. The data were taken from the World Bank Database (WDI).

3.2. Variable Selection and Rationale

To study the relationship between health and economic growth, we selected a sample of 5 CEMAC (Communauté Economique des Pays d'Afrique Centrale) countries over annual periods from 1970 to 2019. The dependent variable is gross domestic product per capita in PPP purchasing power parity at constant 2010 prices.

Several explanatory variables are used. These are, respectively, life expectancy at birth, average years of schooling, gross fixed capital formation, general government final consumption expenditure as a percentage of GDP, foreign direct investment and trade openness. The other explanatory variables are GDP per capita lagged one, then two periods, population, and urban population.

3.3. Econometric Specification

The model used is a dynamic panel with GDP per capita growth as the dependent variable. We use the panel data estimation technique because it allows us to take account of heterogeneity between individuals in the countries studied, and also to resolve multicollinearity problems. Our econometric model is based on the dynamic panel method, which introduces one or more lags of the dependent variable, in this case the logarithm of GDP per capita, as an explanatory variable. The econometric analysis of the link between health and economic growth proposed in this article is based on growth estimates. We will estimate the following model, like Fall (2017):

GDP/capita = ß1GDP/capita-1 + ß2GDP/capita-2 + ß3Espvietit + ß4Txmortit + ß5Yrsschit + ß6FBCFit + ß7OUVCOMit + ß8IDEit + ß9ConsPubit + ß10Popit + ß11UrbPopit + C

where (i) designates the country studied and (t) refers to the analysis period, C is the model constant.

GDP per capita: is the growth rate of real GDP per capita for country i in period t.

GDPit-1: is the growth rate of real GDP per capita for country i in period t − 1.

GDPit-2: is the growth rate of real GDP per capita for country i in period t − 2

EspVieit: is life expectancy in country i at period t

TxMortit: is the mortality rate of country i at period t

OUVCOMit: represents the degree of trade openness of country i's economy at period t (the sum of the volume of exports and imports of goods and services) in % of real GDP.

GFCFit: gross fixed capital formation of country i in period t, expressed as a percentage of GDP.

FDIit: is inward foreign direct investment, expressed in millions of dollars.

Cons_Pubit: is general government final consumption expenditure as a percentage of GDP for country i in period t.

Yrsschit: is the average number of years of schooling in country i at period t, used as a proxy for human capital.

POPpit: the total population of country i at period t.

Popurbit: urban population expressed as a % of the total population of country i at period t

The dynamic panel Generalized Moment Method (GMM) provides an efficient estimation of the above model, in contrast to the Ordinary Least Squares (OLS) method, while controlling for individual and time-specific effects and addressing endogeneity biases in explanatory variables such as GDP per capita and other explanatory variables through instrumental variables generated by their lags. To estimate our model, we use the Difference Generalized Moment Method (Diff GMM) of Arellano and Bond (1991). This estimator is based on the first difference of the variables and thus eliminates country-specific effects, while taking as instruments appropriate levels of lagged values (in level) for all potentially endogenous variables. The GMM method is estimated using STATA software.

Beforehand, all tests of variable stationarity have been carried out (Levine, Lin and Chu (LLC) test and Im, Pesaran and Shin (IPS) test).

4. Presentation and Interpretation of Results

The results of the dynamic panel generalized method of moments (GMM) model estimation are presented in **Table 1**. The inclusion in the model of two lagged values of the endogenous variable LogPIBit-1 and LogPIBit-2 is necessary, as this is a dynamic autoregressive model. The introduction of the lag makes it possible to check whether economic growth in one year is influenced by growth in previous years. In addition, in the growth analysis equation, lagged variables make it easier to take into account the staggered effects of growth-promoting policy decisions, which often have no immediate impact on the economy.

Arellano and Bond's (1991) first-difference and second-difference autocorrelation tests for residuals and the Sargan/Hansen over-identification test, presented in the last three rows of **Table 1**, provide important information. As can be seen, the serial autocorrelation test of the Arrellano and Bond residuals in first difference in the model (p-value of AR (1) = 0.043 and P-value of AR (2) = 0.44) validates the GMM specification of the model, hence the absence of second-order autocorrelation. As for Sargan's t-statistic, it validates the choice of instruments, with p-values for the model equation below 0.05, confirming that the instruments used are significant and valid. The GMM model can therefore be used to analyze the relationship between health and economic growth in the CEMAC region.

Analysis of the coefficients of our regression shows that four variables are significant at 1%. These are: GDP lagged by one, then two periods, life expectancy at birth, crude death rate. Three variables are significant at 5%: These are; foreign direct investment, secondary school enrolment ratio and government final consumption expenditure as a percentage of GDP. Gross fixed capital formation is significant at 10%. Three variables are not significant: trade openness, urban population and total population.

Life expectancy at birth, our variable of interest, positively explains economic growth in CEMAC countries. A 1% increase in life expectancy at birth increases GDP per capita by 0.032% (Bhargava et al., 2001). When GDP lagged two periods increases by 1%, the growth rate decreases by 0.291%. On the other hand, when the lagged GDP of one period increases by 1%, the economic growth rate increases by 1.19%, which is considerable. This situation is probably the result of the economic policy measures we have implemented, which are beginning to have an effect.

The crude death rate is significant at 1%, but does not have the expected sign. Indeed, when the crude death rate increases by 1%, GDP/H increases by 0.629%. This result is hardly surprising, given that the considerably higher expenses associated with deaths and burials are likely to have a positive impact on economic growth, and hence on GDP/H.

FDI has a significant coefficient, positive at 5%. When FDI increases by 1%, GDP per capita rises by 0.013%. Increased FDI in CEMAC countries improves economic growth. This result is consistent with most theoretical and empirical

Table 1. Dynamic Panel Data Model by Arellano and Bond (1991) system-GMM Dependent variable: logarithm of GDP per capita PPP (constant price base 2011).

LogPIB_it-1	1.19***
	(0.077)
LogPIB_it-2	−0.291***
	(0.092)
logEsp_vie_nais	0.032***
	(0.005)
Logtbm	0.659***
	(0.079)
Logpop_urb	0.101
	(0.108)
logPOPp	−0.012
	(0.017)
logIDE	0.013**
	(0.007)
LogYRSSCH	−0.078**
	(0.036)
logFBCF	−0.131*
	(0.071)
LogCONPUB	−0.446**
	(0.227)
logtOUVCOM	0.006
	(0.078)
Constant	−2.29***
	(0.758)
Number of observations	240
Number of groups	5
AB auto-correlation test AR-1 in 1st difference	z = −2.02
	Pr > z = 0.043
AB auto-correlation test AR-2 in difference 1st	z = 0.77
	Pr > z = 0.44
Sargan over-identification test	Chi^2 (277) = 441
	Prob > chi^2 = 0.00

Source: author's calculation in Stata 13.0; Note: NB: *** = Significant at 1%; ** = prob significant at 5%; * = prob significant at 10%.

analyses carried out in this context (e.g. Hanchane and Abdouni, 2004). This underlines the driving role of FDI in the growth process of developing countries.

The number of years of secondary schooling is significant at 5%. When this variable increases by 1%, GDP per capita decreases by 0.078% (Pritchett, 2001). This result is not in line with the literature. It may be explained by the lack of linkages between economic sectors in the different countries of the region studied. Indeed, the economies of these countries are essentially based on a single resource, oil, which uses very little labor. This is the situation in Congo, Gabon and Chad. Only Cameroon is less dependent on this resource, even if its share of GDP is not negligible. Oil accounts for less than 10% of its GDP (OECD).

Government final consumption is statistically significant at 5% and has a negative impact on economic growth in CEMAC countries. When government final consumption increases by 1%, GDP per capita falls by 0.446%. This result confirms the conclusions of a number of econometric studies on the subject (Borensztein et al., 1994; Barro, 1997; Bassanini and Scarpetta, 2001).

The result of our estimation gives a positive and statically significant effect at 10% of gross fixed capital formation (GFCF), but does not have the expected sign. According to this result, a 1% increase in GFCF reduces GDP per capita by 0.131%.

Finally, the coefficient linked to trade openness and the coefficients attributed to demographic variables, namely total population and urban population, are not significant.

Admittedly, the econometric results show that the link between health and economic growth has been verified. However, they also lead us to reflect on the type of policy that should be favored to achieve better results. Indeed, the health systems of these countries need to be improved to come closer to the standards of moderately developed countries in terms of health, such as Cuba.

Indeed, it is a global policy that these countries must pursue over the long term. This should enable them to achieve a minimum level of economic development, which is not necessarily high. To achieve this, it is necessary to promote policies focused on achieving sufficient, sustainable economic growth to meet investment and maintenance expenditure, which, in the health sector, rises sharply once the fight against major infectious or parasitic diseases is over. This increase in the wealth of CEMAC countries should enable them to ensure a minimum food intake compatible with a normal state of health; to have a cleaner environment, better-quality health and education provision, drinking water for all, decent housing, etc.

5. Conclusion

The aim of this article was to study the link between health and economic growth in the CEMAC countries, using the dynamic panel generalized method of moments.

Overall, the estimates derived from our model are statistically significant and robust. Two main findings emerge. Firstly, our variable of interest, life expectancy, positively explains economic growth in CEMAC countries. This result, in line with the numerous studies carried out in this field, justifies the imperative need to increase healthcare spending in this zone. Indeed, faced with ever-increasing demands from other sectors of the economy, public authorities are finding it increasingly difficult to allocate more resources to the health sector. A scientific study corroborating the link between health and economic growth can still serve as a decision-making tool, and thus encourage an increase in resources in this sector, despite all the existing constraints. What's more, the coronavirus effect has shown us that we need to invest in the health sector, as the economic benefits are substantial.

Secondly, one of our control variables, the mortality rate, is significant but does not have the expected sign. Increased mortality promotes economic growth. Expenditure on burial of the deceased is increasingly high, to the point of becoming prohibitive for many families in CEMAC zone countries. The additional costs associated with burial are putting a strain on many families, who are forced to rely on the solidarity of family and friends to raise the sums needed to pay for the funeral.

A useful extension of this work could be to analyze the impact of mortality on economic growth. This would make it possible to clarify this link, using mortality as the variable of interest.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Acemoglu, D., & Johnson, S. (2007). Disease and Development: The Effect of Life Expectancy on Economic Growth. *Journal of Political Economy, 115,* 925-985. https://doi.org/10.1086/529000

Aghion, P., Howitt, P., & Murtin, F. (2010). Le bénéfice de la santé, un apport des théories de la croissance endogène. *Revue de l'OFCE, No. 112,* 88-108. https://doi.org/10.3917/reof.112.0087

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economics Studies, 58,* 277-297. https://doi.org/10.2307/2297968

Barro, J. R., & Sala-I-Martin, X. (1995). *Economic Growth*. McGraw-Hill.

Barro, R. J. (1990). Government Spending in a Simple Model of Endogenous Growth. *Journal of Political Economy, 98,* 103-125. https://doi.org/10.1086/261726

Barro, R. J. (1997). *Determinants of Economic Growth: A Cross-Country Empirical Study.* PIT Press. https://doi.org/10.3386/w5698

Bassanini, A., & Scarpetta, S. (2001). Les moteurs de la croissance dans les pays de l'OCDE: Analyse empirique sur des données de panel. *Revue Économique de l'OCDE, No. 33,* 7-58. https://doi.org/10.1787/eco_studies-v2001-art10-fr

Becker, G. (1964). *Human Capital. A Theoretical and Empirical Analysis with Special Reference to Education* (187 p.). Columbia University Press.

Bhargava, A., Jamison, D., Lau, L., & Murray, C. (2001). Modelling: The Effects of Health on Economic Growth. *Journal of Health Economics, 20,* 423-440. https://doi.org/10.1016/S0167-6296(01)00073-X

Bloom and Malaney (1998). The Effect of Health on Economic Growth: A Production Function Approach. *World Development, 32,* 1-13. https://doi.org/10.1016/j.worlddev.2003.07.002

Borensztein et al. (1994). *The Evolution of Output in Transition Economies: Explaining the Differences*. International Monetary Fund.

CMH (2001). *Macroeconomics and Health: Investing in Health for Economic Development*. Report of the Commission on Macroeconomics and Health, OMS.

De La Croix, D., & Doepke, M. (2003). Inequality and Growth: Why Differential Fertility Matters. *American Economic Review, 93,* 1091-1113. https://doi.org/10.1257/000282803769206214

Diagne, A. (2007). Investir sur le capital humain: Education et santé. *African Development Review, 19,* 163-199. https://doi.org/10.1111/j.1467-8268.2007.00159.x

Fall, N. (2017). Santé et croissance économique dans les pays de l'union économique et monétaire ouest africain (UEMOA). *Revue Interventions Économiques*. https://doi.org/10.4000/interventionseconomiques.5763

Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy, 80,* 223-255. https://doi.org/10.1086/259880

Gyimah-Brempong, K., & Wilson, M. (2004). Health Human Capital and Economic Growth in Sub-Saharan Africa and OECD Countries. *The Quarterly Review of Economics and Finance, 44,* 296-320. https://doi.org/10.1016/S1062-9769(03)00055-3

Hanchane, S., & Abdouni, A. (2004). *The Dynamics of Economic Growth and Openness in Developing Countries: Some Empirical Investigations Based on Panel Data*. Working Papers Halshs-00083720, HAL.

Hartwig, J. (2009). Is Health Capital Formation Good for Long-Term Economic Growth?—Panel Granger-Causality Evidence for OECD Countries. *Journal of Macroeconomics, 32,* 314-325.

Jamison, D., Lau, L., &Wang, J. (2004). *Health's Contribution to Economic Growth in an Environment of Partially Endogenous Technical Progress*. Disease Control Priorities Project Working Paper 10. https://doi.org/10.7551/mitpress/3451.003.0007

Kocoglu, Y., & De Albuquerque David, R. (2009). Santé et croissance de long terme dans les pays développés: Une synthèse des résultats empiriques. *Public Economics, 24-25,* 1-2. http://economiepublique.revues.org/8478

Lucas, R. E. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics, 22,* 3-42. https://doi.org/10.1016/0304-3932(88)90168-7

McDonald, S., Roberts, J., & Dixon, S. (2002). The Impact of HIV and AIDS on Africa's Economic Development. *BMJ, 324,* 232-234.

Pritchett, L. (2001). Where Has All the Education Gone? *World Bank Economic Review, 15,* 367-391. https://doi.org/10.1093/wber/15.3.367

Romer, P. (1986). Increasing Return and Long-Run Growth. *Journal of Political Economy, 94,* 1002-1037. https://doi.org/10.1086/261420

Schultz, T. W. (1961). Investment in Human Capital. *American Economic Review, 51,* 1-17.

Suhrcke, M., & Urban, D. M. (2006). *Are Cardiovascular Diseases Bad for Economic Growth*? CESifo, No. 1845. https://doi.org/10.2139/ssrn.949412

Ulmann, P. (1999). Les relations entre santé et croissance dans les pays développés. *Les Cahiers du Gratice, No. 15,* 9-44.

Ulmann, P. (2009). *Health, a Factor of Economic Growth. Treatise on Health Economics and Management*. Presses de Sciences Po.

Weil (2005). *Accounting for the Effect of Health of Economic Growth*. Brown University Department Economics Working Paper. https://doi.org/10.3386/w11455

Weil (2007). Accounting for the Effect of Health of Economic Growth. *The Quarterly Journal of Economics, 122,* 1265-1306. https://doi.org/10.1162/qjec.122.3.1265

WHO (2001). *Macroeconomics and Health for Economic Development*. Word Health Organization.