Economics Bulletin

Volume 41, Issue 2

The synergistic effect of government health spending and institutional quality on health capital accumulation in WAEMU countries

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Abstract

This paper examines the synergistic effect of government health spending and institutional quality on health capital accumulation in WAEMU countries over the period 2000-2015. By using two stage least squares (2SLS), we find that in addition to the positive effect of public health spending and institutional quality on the accumulation of health capital, these two variables have a synergistic effect. These results suggest that maximizing returns from government health spending requires improving of the institutional quality.

Citation: Issa Dianda and Idrissa Ouedraogo, (2021) "The synergistic effect of government health spending and institutional quality on health capital accumulation in WAEMU countries", *Economics Bulletin*, Vol. 41 No. 2 pp. 495-506.
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Submitted: October 23, 2020. **Published:** April 09, 2021.

1. Introduction

Health is a crucial component of human capital seen as both a critical ingredient for economic growth, peaceful and stable society building and development goal (Barro, 2013; Bloom, 2014). This importance is recognised in the Sustainable development goals and Agenda 2063 of the African Union. In view of its importance, researchers have questioned the determinants of health capital.

In this vein, the first works looked at economic factors, including government health spending as being the main determinant of health capital (Filmer and Pritchett, 1997,1999; Pritchet and Summers, 1996). Public health expenditure is used as an economic policy tool for the financing and provision of health services with a view to facilitate their access, in particular by the most disadvantaged and ultimately improve the health capital (Anyanwu and Erhijakpor, 2009). However, empirical evidences report that the effect of health spending on health outcomes is mixed and financial resources alone do not explain the difference in health capital accumulation between countries (Arthur and Oaikhenan, 2017; Novignon *et al.*, 2012). Hence the need to explore other factors. From this perspective, there is an increasing evidence that institutions are also a critical ingredient for health capital accumulation (Azfar and Gurgur, 2008; Biadgilign *et al.*, 2019). This growing interest results from the fact that the characteristics of health sector (uncertainties, asymmetric information between stakeholders and many dispersed actors, see Arrow, 1963) predispose it to poor institutional quality. Better institutions provide incentives for economic agent to invest more in their health, given the higher potential for reaping the benefits of this long-term investment (Acemoglu, 2008a;2008b; Klomp and Haan, 2009;Sen, 2015). In addition, better institutions contribute to the improvement of the quality of medical infrastructure and equipment, promote a better spatial distribution of health facilities and subsequently improve the quality of health services and health outcomes (Ablo and Reinikka, 1998; Bousmah *et al.*, 2016). In addition to this direct effect, the quality of institutions matters in the accumulation of health capital indirectly through enhancing the effect of government health spending on health capital (Lewis, 2006). Indeed, the delivery of health care services can be hampered in the absence of a good institutional quality, leading to a marginal effect of expenditure on health in the perspective of improving health, limiting the return on investment of resources allocated to the sector (Murshed and Ahmed, 2018). When the institutional quality is good, the governments' rent-seeking activities and the wasting of public resources allocated to the health sector are limited (Acemoglu, 2008b). This synergistic effect between the quantitative (public health expenditure) and qualitative (institutional quality) intervention of government on improving health capital was highlighted in empirical work (Farag *et al.*, 2013; Makuta and O'Hare, 2015; Murshed and Ahmed, 2018; Odhiambo *et al.*, 2015a; Rajkumar and Swaroop, 2008). Other empirical studies, on the other hand, questioned this complementarity (Kamiya, 2011; Hu and Mendoza, 2013) while some authors even found that better institutional quality reduces the effectiveness of public health expenditure (Odhiambo *et al.*, 2015b).

In the West African Economic and Monetary Union (WAEMU) countries, the performance of the health sector, in terms of domestic public financing and improving the health status of the population remains weak. According to World Development Indicators (WDI) (World Bank, 2018a), in 2015, apart from Niger and Senegal (with 62 and 67 years respectively), the other countries of the Union had a life expectancy lower than that of low-income countries (62 years). Likewise, three of the eight WAEMU countries (Côte d'Ivoire, Guinea Bissau and Mali) had in 2015 life expectancies lower than Sub Saharan Africa (SSA) (59 years). In addition, in 2015, six countries (Senegal and Togo not included) had an under-five mortality rate higher than the SSA average (83 ‰) and that of low-income countries (62 ‰). Likewise,

the per capita domestic public health expenditure that is set at US $ 26 in 2015 was also low.

This weakness is also noted at the institutional quality level. Indeed, examination of the six indicators of the World Bank's Worldwide governance indicators (WGI) reveals that better institutional quality is not the thing best shared in the WAEMU countries. These indicators are scaled from -2.5 for poor institutional quality to 2.5 for good institutional quality. On average, they were all negative in the Union over the period 1996- 2016 (World Bank, 2018b).

At the same time, health problems are among the most worrying to the populations. Indeed, the 2014-2015 Afrobarometer opinion poll revealed that the proportion of respondents in the Union who believed that health was among the three main problems they faced (between 32% and 49%) was higher than the average of the 36 countries covered by the survey (32%) (Armah-Attoh *et al.*, 2016). Moreover, Union respondents designated this sector as the second priority for additional investment if the government could increase its spending, after the education sector. Besides, the WAEMU context is marked by the commitment of its member countries in public finance reforms that should lead to the implementation of the state budget following the program approach. In this approach, the resources allocated to the different sectors are directly linked to their outcomes. The implicit assumption made is that an increase in the resources of a department or program should translate into an improvement in its outcome indicators.

This context of reforms in which the quality of institutions is deficient, coupled with the weakness of health indicators and the deficit of public health domestic financing raise a question: What is the synergistic effect of domestic public health expenditure and institutional quality on health capital accumulation in the Union? We hypothesize that public health expenditure and institutional quality have a synergistic effect in improving health capital.

The remainder of this article is organised into three sections. After the introduction, the second section presents the methodology. The third section discusses the empirical results. The last one concludes.

2. Methodology and data

In this section, the econometric model, the variables used and estimation technique are presented.

2.1. Econometric model and variables

To investigate the synergistic effect of government health spending and institutional quality on health capital accumulation in WAEMU countries, we follow the macroeconomic health production function developed by Fayissa and Gutema (2005) based on Grossman's model (1972). We estimate four equations. In the first equation (equation 1), health capital is estimated on institutional quality and public health spending without the interaction term and without the control variables. In the second equation (equation 2), health capital is estimated on institutional quality and public health spending with the interaction term and without the control variables. In the third equation (equation 3), health capital is estimated on institutional quality and public health spending without the interaction term and with control variables. Finally, in the fourth equation (equation 4), health capital is estimated on institutional quality, public health spending with the interaction term and with the control variables. These equations allow us to explore whether the interaction term is significant with or without the control variables. The four equations are presented below:

$$HCI_{it} = \alpha_0 + \alpha_1 INST_{it} + \alpha_2 PCDGHS_{it} + \varepsilon_{it} \quad (1)$$

$$HCI_{it} = \alpha_0 + \alpha_1 INST_{it} + \alpha_2 PCDGHS_{it} + \alpha_3 INST_{it} * PCDGHS_{it} + \varepsilon_{it} \quad (2)$$

$$HCI_{it} = \alpha_0 + \alpha_1 INST_{it} + \alpha_2 PCDGHS_{it} + \varphi_j X_{jt} + \varepsilon_{it} \quad (3)$$

$$HCI_{it} = \alpha_0 + \alpha_1 INST_{it} + \alpha_2 PCDGHS_{it} + \alpha_3 INST_{it} * PCDGHS_{it} + \varphi_j X_{jt} + \varepsilon_{it} \quad (4)$$

with, HCI is health capital indicator approximated by the under-five mortality rate per 1000 births; PCDGHS represents per capita domestic government health spending in US $ in PPP; INST is the indicator of institutional quality. X contains a set of control variables including the domestic private health spending per capita, the aid allocation to health per capita, GDP per capita, the rate of access to drinking water, the urbanization rate and the gross primary school enrolment rate; α_1 and α_2 respectively capture the effect of institutional quality and public health expenditure on health capital. By taking into account the synergistic effect suggested by Rajkumar and Swaroop (2008), an interactive variable between the indicator of institutional quality and domestic government health spending is introduced into equations 2 and 4.

Regarding the institutional quality indicator, in general, studies that have assessed the joint effect of government health spending and institutional quality on health capital have used a single dimension of institutional quality or several dimensions but separately (Makuta and O'Hare, 2015; Odhiambo *et al.*, 2015a; 2015b). However, institutional quality is a multidimensional concept and the use of one dimension does not make it possible to define the whole concept (Fukuyama, 2016). Using one indicator while ignoring others may lead to omitted variables bias (Keho, 2012). Besides, the use of all these indicators in an econometric equation can lead to multicollinearity problems because these variables may be highly correlated. To deal with these econometric problems, we construct a synthetic indicator from the six institutional indicators (government effectiveness, voice and accountability, political stability and absence of violence and terrorism, rule of law, regulatory quality, and control of corruption) using the principal component analysis. These indicators are from the Worldwide Governance Indicators (World Bank, 2018b).

The data used are annual and cover the eight WAEMU countries over the period 2000-2015. Apart from institutional quality, the other variables come from WDI database of the World Bank (2018a).Table 1 below summarises some descriptive statistics of the main variables used over the period 2000-2015.

Table 1: Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Under-5 mortality rate (‰)	128	124.654	36.017	49.500	226.500
Institutional quality	128	-0.599	.374	-1.416	0.0316
Domestic government health spending per capita ($ US in PPP)	128	20.265	8.625	4.568	41.382
Domestic private health spending per capita ($ US in PPP)	128	45.549	24.463	13.017	122.678
Health aid per capita ($ US in PPP)	128	13.275	10.101	1.737	49.946
GDP per capita ($ US in PPP)	128	1552.174	583.050	597.190	3451.880
Rate of access to clean water (%)	128	59.162	10.324	37.998	75.189
Urbanisation rate (%)	128	35.739	10.289	16.186	54.180
Gross primary school enrolment rate (%)	114	84.375	24.446	32.322	132.468

Source: Authors' computation from WDI and WGI

These statistics reveal an average institutional quality established at -0.59 on a scale of -2.5 to 2.5, with -2.5 reflecting poor institutional quality and 2.5 better institutional quality, thus suggesting institutions are weak. The average under-five mortality rate is 125 ‰. This means that in WAEMU, between 2000 and 2015, out of 1,000 births, 125 children died before their fifth anniversary. Under the period, the domestic government health spending per capita was established at US $ 20.26 in PPP.

2.2. Estimation technique

Fixed and random effects methods were used in empirical investigations on the drivers of health capital accumulation (Fayissa and Gutema, 2005; Novignon *et al.*, 2012; Novignon and Lawanson, 2017). However, the literature reveals that public health expenditure and institutional quality are both endogenous due to reverse causality and measurement errors. Bousmah *et al.* (2016) maintain that health expenditure could be a response to mortality shocks. Likewise, Wagstaff and Claeson (2004) argue that governments can choose the level of expenditure for a given sector such as health on the basis of its indicators. In addition, Acemoglu *et al.* (2014) and Edison (2003) point out that institutions are endogenous by nature. Indicators of institutional quality are not observed but estimated and that for this reason their measures contain errors. In the presence of endogenous variables, fixed and random effects methods produce biased results. To deal with the endogenous problem, in the literature two instrumental variables methods are widely used: Generalized method of Moments (GMM) and the two stage least squares (2SLS). We cannot use GMM here because, it can be applied to "Small T, large N" panels in which there are many individuals and a few time periods (Roodman, 2009). In our case, N = 8 countries and T = 16 years. We therefore use 2SLS to account for endogeneity problems by instrumenting the endogenous variables by their lags. Instruments should be correlated with the endogenous regressors, and they should be orthogonal to any other omitted characteristics and not correlated with the error terms in the equations. Tables 2, 3 and 4 show that the test of Sargan is not significant. In other words, the instruments are not correlated with the error term meaning that the instruments are valid. In addition, the Kleibergen-Paap rk LM is significant at 1%. For this reason, the null hypothesis that the first stage is under-identified can be rejected, so the instruments are correct (see Tables 2, 3 and 4).

3. Empirical results

The baseline results and the robustness checks are presented.

3.1. Baseline results

In the baseline model, in order to assess the direct and indirect effect of institutional quality on health capital accumulation, four equations are estimated. The first takes into account government health expenditure and the indicator of institutional quality. As for the second, in addition to these two variables of interest, it takes into account an interactive variable between the indicator of institutional quality and government health expenditure. The third takes into account, in addition to our two explanatory variables of interest, the control variables. The fourth equation is the third equation to which we have added the interactive variable public health expenditure and institutional quality. The result of the estimates is shown in Table 2 below.

Table 2*:* Effects of public health expenditure and institutional quality on under-5 mortality rate

Variables	Under-5 mortality rate			
Domestic government health spending per capita	-1.355*** (0.418)	-4.636*** (0.809)	-1.384*** (0.435)	-4.635*** (0.711)
Institutional quality	-92.630*** (18.016)	-126.0*** (26.75)	-36.11*** (12.45)	-150.6*** (23.58)
Interactive variable		-5.181*** (1.158)		-5.489*** (1.004)
Domestic private health spending per capita			0.191 (0.283)	0.137 (0.256)
Health aid per capita			0.862*** (0.326)	0.317 (0.312)
GDP per capita			-0.052*** (0.017)	-0.045*** (0.015)
Rate of access to clean water			-2.882*** (0.815)	-2.415*** (0.740)
Urbanisation rate			5.457*** (1.091)	4.956*** (0.989)
Gross primary school enrolment rate			-1.360*** (0.203)	-1.300*** (0.183)
Observations	112	112	98	98
Number of countries	8	8	8	8
R-squared	0.089	0.195	0.530	0.617
F-statistic	63.995	36.196	38.118	29.933
Kleibergen-paap rk LM Statistic p-value	0.000	0.000	0.000	0.000
Sargan J statistic p-value	0.663	0.461	0.374	0.460

Note: Standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.
Source: Authors' estimation from WDI and WGI

The estimates reveal that the coefficient associated with government health expenditure is negative and significant at the 1% level, suggesting that government health expenditure contributes to the reduction of under-five mortality in WAEMU. This conclusion is consistent with theoretical expectations, including the predictions of Grossman's (1972) model that investment in health improves health capital. Government health spending, by allowing wider access to health care, especially to the poorest segments of the population can reduce under 5 child mortality rates (Gupta *et al.*, 2003). This result consolidates the conclusion of the work devoted to panels of African countries which reveals that public health expenditure improves the health capital (Anyanwu and Erhijakpor, 2009; Arthur and Oaikhenan, 2017; Novignon and Lawanson, 2017). However, the result is out of step with that of the authors who came to the conclusion that public health expenditure is not a determining factor in reducing child mortality (Atake, 2015; Filmer and Pritchett, 1997; 1999; Kamiya, 2011; Messaili and Tlilane, 2017). It also calls into question the results of studies which have reached the conclusion that public health expenditure deteriorates health capital (Berger and Messer, 2002; Kulkarni, 2016).

From Table 2, it emerges that the coefficient of institutional quality is negative and significant at 1% level. An improvement in the institutional quality in the Union translates, all other

things being equal, into a reduction in under-five mortality. This result is in line with theoretical expectations. Indeed, better institutional quality improves the quality of health services and promotes their accessibility and use (Ablo and Reinikka, 1998; Azfar and Gurgur, 2008). In addition, better institutions provide incentives for households, enterprises and governments to spend more on health and education (Sen, 2015). This result is in accordance with the results of the authors who found that better institutional quality improves health capital in African countries (Biadgilign *et al.*, 2019; Witvliet *et al.*, 2013; Wolf, 2007). However, this result contradicts those according to which institutional quality does not have a statistically significant effect on health capital (Kamiya, 2011).

The interactive variable between the institutional quality indicator and government health expenditure has a negative and significant effect at the 1% level both with and without control variables. Likewise, the coefficient of institutional quality indicator and that of health expenditure remain negative and significant at 1% thresholds. This result means that the institutional quality and public expenditure on health have a positive and interactive effect on child survival. Thus, beyond the direct beneficial effect of institutional quality on health capital through a reduction in child mortality, it improves the effectiveness of public health expenditure in the WAEMU. There is therefore a complementarity between the two variables in the explanation of children health capital accumulation. Increased public health spending must be accompanied by a better institutional environment to ensure better health for children, enabling them to become more productive during their working life. This result is in line with the predictions of the theoretical model of Lewis (2006) for which improving the institutional quality strengthens the effectiveness of health spending. By increasing the efficiency with which health systems use resources and limiting the loss and waste of resources (Fonchamnyo and Sama, 2016), a better institutional quality improves the effectiveness of these resources, including public health spending. This result supports studies which found that better institutional quality strengthens the contribution of public health expenditure to improving health capital (Farag *et al.*, 2013; Makuta and O'Hare, 2015; Murshed and Ahmed, 2018; Rajkumar and Swaroop, 2008; Odhiambo *et al.,* 2015a). However, it is out of step with that of authors who question the role of institutional quality in the effectiveness of public health spending (Hu and Mendoza, 2013; Kamiya, 2011; Odhiambo *et al.*, 2015b).

The effect of the control variables is mixed. GDP per capita, education and access to clean water are associated with a lower under-five morality rate. As Pritchet and Summers (1996) pointed out, "*wealthier is healthier*''. The increase in per capita income favours a better nutrition and hygiene, access to medical care and adequate housing and hence improves health capital. This result is consistent with those of Hu and Mendoza (2013) that income improves health outcomes. Likewise, a better access to drinking water makes it possible to prevent water-related diseases such as cholera, typhoid and diarrheal diseases and to limit child mortality. From this perspective, Gebretsadik and Gabreyohannes (2016) found that in Ethiopia, a child born in a family without access to drinking water is 72% more likely to die before his fifth birthday compared to a child whose family has access to it. The beneficial effect of access to drinking water in terms of reducing child mortality is in line with that obtained by Arthur and Oaikhenan (2017) in SSA countries. Furthermore, education is a positive factor in reducing under-five mortality rates. This result is consistent with the predictions of Grossman (1972) who argued that improved educational attainment leads to improved health capital. This improvement results from the fact that with education, the individual becomes more efficient in combining resources to produce health capital while taking good care of his health through proper care and adoption of healthy living styles. Empirically, this result confirms that obtained in studies carried out in SSA (Negeri and Halemariam, 2016; Novignon and Lawanson, 2017). However, it questions the result

established by Messaili and Tlilane (2017) that education has no significant effect on health capital in Algeria.

Conversely, private domestic health expenditure, health aid and urbanisation rate exhibit a positive relationship with under five mortality. The coefficient associated with private domestic health expenditure per capita is positive but not significant. This result agrees with the findings of Novignon and Lawanson (2017) who found that private health expenditure does not have a statistically significant effect on under five mortality in sub-Saharan Africa. However, it is in contradiction with the findings that private health expenditure contributes to health improvement in SSA (Novignon *et al.*, 2012). The results also suggest that external aid allocated to health increases under-five mortality. Indeed, its coefficient is positive and significant at the 1% level even if it became not significant when interactive variable is introduced. Aid to the health sector have not been translated to improvement in under-five survival in WAEMU. As Lu *et al*. (2010) have empirically demonstrated, health aid crowds out public spending on health, which may adversely affect health capital accumulation. The estimates reveal that under five mortality rates increases with urbanisation. Urbanization is a source of stress, pollution and congestion, factors which can degrade health capital.

3.2. Robustness tests

Robustness tests are carried out. In this regard, alternative health indicators are used as dependent variables. Life expectancy at birth and Human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS) prevalence rate are used as alternative dependent variables. The results obtained are portrayed in Table 3 and Table 4.

Table 3: Robustness test with life expectancy at birth as indicator of health capital

Variables	Life expectancy at birth			
Domestic government health spending per capita	0.122**	0.404***	0.203***	0.491***
	(0.049)	(0.107)	(0.051)	(0.087)
Institutional quality	5.467***	8.830***	2.683**	9.121***
	(0.937)	(2.270)	(1.225)	(2.872)
Interactive variable		0.445***		0.487***
		(0.152)		(0.122)
Domestic private health spending per capita			-0.044	-0.039
			(0.033)	(0.031)
Health aid per capita			-0.095**	-0.047
			(0.038)	(0.038)
GDP per capita			0.003	0.002
			(0.002)	(0.002)
Rate of access to clean water			0.578***	0.537***
			(0.095)	(0.090)
Urbanisation rate			-0.788***	-0.744***
			(0.127)	(0.120)
Gross primary school enrolment rate			0.161***	0.156***
			(0.024)	(0.022)
Observations	112	112	98	98
Number of countries	8	8	8	8
R-squared	0.286	0.309	0.616	0.656

F-statistic	63.995	64.370	62.397	62.237
Kleibergen-paap rk LM Statistic p-value	0.000	0.000	0.000	0.000
Sargan J statistic p-value	0.523	0.641	0.475	0.646

Note: Standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.
Source: Authors' estimation from WDI and WGI

The coefficient of institutional quality and government health spending are significant at conventional thresholds and has a positive sign for life expectancy at birth and negative for HIV/AIDS prevalence. Thus, life expectancy at birth increases with institutional quality and government health spending. Conversely, the prevalence of HIV/AIDS decreases when the institutional quality and government health spending improves. This result highlights the positive effect of institutional quality and government health spending on health capital accumulation.

Table 4: Robustness with HIV/AIDS prevalence rate as indicator of health capital

Variables	HIV/AIDS prevalence rate			
Domestic government health spending per capita	-0.048*** (0.008)	-0.033** (0.016)	-0.021** (0.009)	-0.041** (0.021)
Institutional quality	-3.373*** (0.222)	-2.675*** (0.794)	-2.874*** (0.328)	-1.943*** (0.687)
Interactive variable		-0.073** (0.034)		0.090*** (0.024)
Domestic private health spending per capita			-0.0227*** (0.007)	-0.023*** (0.007)
Health aid per capita			-0.006 (0.009)	-0.010 (0.009)
GDP per capita			0.000 (0.000)	0.000 (0.000)
Rate of access to clean water			-0.143*** (0.022)	-0.139*** (0.022)
Urbanisation rate			0.234*** (0.029)	0.230*** (0.029)
Gross primary school enrolment rate			-0.024*** (0.005)	-0.023*** (0.005)
Observations	112	112	98	98
Number of countries	8	8	8	8
R-squared	0.681	0.680	0.809	0.811
F-statistic	63.995	36.196	38.118	29.933
Kleibergen-paap rk LM Statistic p-value	0.000	0.000	0.000	0.000
Sargan J statistic p-value	0.362	0.836	0.676	0.449

Note: Standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.
Source: Authors' estimation from WDI and WGI

The results also show that the coefficient of the interaction term between domestic public health spending per capita and institutional quality is negative and statistically significant for HIV/AIDS prevalence and positive and statistically significant life expectancy at birth. These results support the hypothesis that better institutional quality enhances the effectiveness of

government spending on health capital. They confirm those obtained with under-five mortality rate.

4. Conclusion

This article analysed the synergistic effect of institutional quality and government health spending on health capital in WAEMU countries over the period 2000-2015. The estimate by the two stage least squares (2SLS) method reveals that improving the institutional quality and government health spending are fundamental to health capital accumulation in the Union. It also emerges that public health expenditure is all the more favourable to the accumulation of health capital as the institutional quality is better: this denotes a synergistic effect. These results indicate that in the WAEMU countries, the improvement of institutional quality is crucial to maximise the benefit from public investments in the health sector.

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