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The Relationship between Public Debt Burden and Health Expenditure in Sub-Saharan African Countries: The Role of Institutional Quality

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ABSTRACT

The historically lower level of public health expenditure of sub-Saharan African (SSA) countries could be partly explained by the mounting debt burden of this region. This consumes a sizable proportion of their domestic resources to debt servicing and potentially decreases their overall budgetary allocations to various sectors in the economy and health expenditure in particular. Using the Generalized Method of Moments (GMM) approach on a sample of 43 sub-Saharan African countries, we examined the relationship between the public debt burden and health expenditure highlighting the role of institutional quality for the period 2000 – 2014. The empirical result confirms that the relationship between public debt burden and health expenditure in sub-Saharan Africa is negative. Interestingly, however, the marginal effect of the relationship between the public debt burden and health expenditure has shown that such a negative relationship turns out to be positive when the quality of the institutions is at maximum. This suggests that the relationship between the public debt burden and health expenditure in sub-Saharan Africa is a function of institutional quality. Therefore, to minimize the negative impact of public debt on health expenditure in sub-Saharan Africa, governments should take determine stand to minimize its debt accumulation and intensify efforts toward the improvement of institutional quality in the region comprehensively.



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1. Introduction

Health have been generally recognized as an important component of human and economic development, which requires adequate funding for its improvement (Bloom, Canning, & Sevilla, 2004; Gong, Li, & Wang, 2012; Lopreite & Mauro, 2017). To this end, governments in sub-Saharan Africa (SSA) has since 2001 demonstrates their political will by pledging to allocate a minimum of 15% of their budgetary allocation to the health sector through Abuja Declaration. However, eighteen years have elapsed while most of these countries were unable to meet the target

(African Data Report, 2016). Health expenditure have been historically low in SSA and this is assumed to be one of the important reasons for its worst calamitous health outcome (Kaseje, 2006).

While an increase in public spending on health is necessary to tackle the health-related challenges, SSA has been overwhelmingly overburdened with mounting indebtedness over the years (Fosu, 1999; Megersa, 2014; Omotola & Saliu, 2009; Richards & Nwankwo, 2010; Uka, 1993). This has potentially drains their foreign exchange reserves and triggered a debt-fueled capital flight (Ndikumana, L., & Boyce, 2011; Ndikumana & Boyce, 2008), which could eventually reduce the overall budgetary allocations to health care financing.

Notwithstanding the growing concern from the notable international nongovernmental organization and several policy analysts over the welfare implications of the mounting indebtedness, research on the impact of public debt burden on health expenditure in the debt-ridden countries is scarcely explored. Mahdavi, (2004) studies the effects of public external debt burden on the composition of government spending on 47 developing countries over the period 1972 to 2001. The study confirmed that public debt burden has a negative effect on capital expenditure. Lora & Olivera, (2006) evaluates the impacts of public debt on social expenditure worldwide and on the unbalanced panel of 50 Latin American countries over the period 1985 to 2003. While the result confirmed that higher debt to GDP ratio reduces the social expenditures, the debt defaulting on debt service obligations tend to increase the social expenditures. On the other hand, the adverse effects of debt and debt-interest payments on Latin America are significantly stronger and make defaulting more advantageous to social expenditures. Later on, Lora & Olivera, (2007) examines the effects of public debt burden on social expenditure on the unbalanced panel of 50 countries over the period 1985 to 2003. The empirical result shows that while higher debt-to-GDP ratios decrease the social expenditures, the debt defaults have a direct positive impact on social expenditures.

Fosu, (2007) investigates the impact of debt service binding constraint on the educational budgetary allocation on a panel 35 SSA countries over the period 1975 to 1994. The empirical reveals that while the total debt servicing has a very slight or no effect on the educational spending, the predicted debt servicing proxies to capture the debt burden shows a deleterious impact considerably. Using a similar sample in the region (Fosu, 2007b) examines the impact of external debt constraints on the social sector for the period 1975 to 1994. Fosu (2008) later investigates the implications of external debt servicing constraints on public health expenditure on a panel of 35 sub-Saharan African countries over the period 1975 to 1994. The results confirmed that debt servicing has a little impact on health expenditure. Shabbir & Yasin, (2015) studies the impact of public debt on social sector spending on seven developing countries in Asia for the period 1980 to 2010. The results confirmed that both the total debt and debt servicing have a negative impact on the total public expenditure and social sector in particular.

However, the new wave of research concludes that the effective utilization of public debt depends to a great extent on the quality of the institutions in the country (Cooray, Dzhumashev, & Schneider, 2017; Daud & Podivinsky, 2014; Jalles, 2011; Kim, Ha, & Kim, 2017; Presbitero, 2008). This finding suggests that only a country with good institutions is better able to manage and use her debt efficiently. Moreover, the effectiveness and relevance of health care financing for better health outcomes are found to be mediated by the quality of the institutions in the country (Bousmah, Ventelou, & Abu-Zaineh, 2016; Makuta & O'Hare, 2015). This might not be unconnected with the fact that good institutions are necessary for an allocative efficiency and effective utilization of the overall national resources and public debt in particular (Agnor & Montiel, 2010). Against this backdrop, this study examines the impact of public debt burden on public health expenditure in SSA and also investigates whether the impact of public debt burden on health expenditure would change with the interaction of institutional quality.

The remaining paper is structured as follows. Section 2 gives highlights of the empirical model, methodology and data sources, and section 3 presents the estimated result and the last section gives a concluding remark.

2. Empirical Model Methodology and Data

2.1 Model Specification

Conventionally, the idea to model the determinants of health expenditure took its roots from the bivariate model of Newhouse (1977) where the health expenditure model was specified as a function of income. Subsequent studies expanded the model to be the function of other additional factors. In order to examine the impact of public debt burden on health expenditure, this study adopts the empirical model by Fosu (2008) and modified into a dynamic function as shown below.

$$HEXP = \beta_0 + \lambda HEXP_{it} + \beta_1 DEB_{it} + \beta_2 INS_{it} + \beta_3 GDP_{it} + \beta_4 FAI_{it} + \beta_5 URB_{it} + \beta_6 IOP_{it} + \varepsilon \quad (1)$$

where HEXP is the health expenditure as a percentage of government expenditure, DEB is the debt burden represented by debt-to-GDP -ratio, debt-to-export ratio and debt service-to-export ratio. GDP is the income level. FAI is the foreign aids, URB is the urbanization; POP is the percentage of population 65 years and above, INS stand for the institutional quality and ε is the error term.

To look at the interaction effects of institutional quality on the relationship between the public debt burden and health expenditure, equation (1) is extended as specified below:

$$HEP = \beta_0 + \lambda HEP_{it} + \beta_1 DEB_{it} + \beta_2 INS_{it} + \beta_3 (DEB * INS)_{it} + \beta_4 GDP_{it-1} + \beta_5 FAI_{it} + \beta_6 UBN_{it} + \beta_7 POP_{it} + \varepsilon_{it} \quad (2)$$

Moreover, the interpretation of the interaction term is based on the computation of marginal effects highlighted by Brambor, Clark, & Golder, (2005) in the following equation:

$$\frac{\delta LHEXP_{it}}{\delta LDEB_{it}} = \beta_2 + \beta_4 INS_{it} \quad (3)$$

2.2 Econometric Methodology

To control for the possibility of the endogeneity problem among the explanatory variables and country-specific effects, we employed the System Generalized Method-of-Moment (GMM) approach developed by Blundell & Bond, (1998) to estimate the health expenditure model. This approach is appropriate for a panel data with large cross-sectional observation (N) and short time (T) as in the present study. It is promising because it provides more information by pooling the individual and time dimension, control individual heterogeneity, better dynamics of adjustment and easy identification of parameters. The approach has an advantage over the other forms of estimation techniques in addressing the simultaneity bias, individual specific effects, avoidance of dynamic panel bias and yield a reliable parameter estimate notwithstanding the measurement errors and endogeneity of the regressor (Bond, Hoeffler, Temple, & Ruj, 2001). To confirm the consistency of this approach, we test for the validity of the instruments and the lagged values of the control variables in the health expenditure regression by considering the Hansen test of over-identifying restrictions. Interestingly, the no rejection of the null hypothesis suggests a non-existence of any correlation between the instrumental variables, and that the residual was equally found to satisfy all the orthogonality conditions. Lastly, the test of a serial correlation was put through and reveals that the errors have no second-order serial correlation.

2.3 The Data

Dataset of 15 years was chiefly drawn from a sample of 43 SSA countries over the period 2000–2014. Annual data on health expenditure public as percentage of government expenditure, debt-to-export ratio, debt service-to-export ratio, real GDP per capita (2010 US\$), Urban population (percentage of total), Population ages 65 and above (percentage of total), Net ODA received (percentage of GNI), are generated from world development indicators (World Bank database). The gross government debt-to-GDP ratio collected from the World Economic Outlook (IMF database).

The institutional quality dataset assembled by the worldwide governance indicator (World Bank database) was used.

Following Fayissa and Nsiah, (2013) all the six subcategories of institutional indicators of political stability, voice, and accountability, regulatory quality, government effectiveness, control of corruption and rule of law were combined to form a single index called institutions using a principal component analysis. To further smoothen the short run fluctuation effects (Law & Singh, 2014) we took an average of three years interval of all the data generated, therefore, our data is having a maximum of 5 observations.

Table 1 presents the descriptive statistics and correlation matrix in panel A and B respectively. The summary of the descriptive statistics (Panel A) shows a significant variation of the percentage of the budgetary allocations that goes to health expenditure across the SSA countries, which ranges from a minimum of 2.34% in the Congo Democratic Republic to 20.55% in Tanzania. In terms of the public debt burden a vast dissimilarity that ranges from a minimum of .47%, 6.78% and 4.32% to a maximum 79.83%, 2508.57 and 715.96%, for the debt service-to-export ratio, debt-to-export ratio, and debt-to-GDP-ratio respectively. Interestingly, although the public debt burden is not monolithic across the SSA countries, yet the standard deviation shows that the majority of the country is highly indebted. The overall institutions are found to be generally weak in SSA, with a variation that ranges from as low as -1.83 for Congo Democratic to as high as .84 for Mauritius.

The correlation matrix presented in panel B shows a negative relationship between the public debt burden and the percentage of government budgetary allocation to health expenditure, and this is in contrast to the institutional quality that has a positive sign. The result of this analysis prompts the need to adopt a more sophisticated methodology to explore the relationship between the public burden and health expenditure and also determine whether this linkage is influenced by the quality of the institution.

Table 1: Descriptive Statistics and Correlation Matrix

Panel A Descriptive Statistics

Variable	Observations	Mean	Standard Dev.	Minimum	Maximum
HEXP	215	10.28	3.66	2.34	20.55
DEBEXP	215	279	366	6.78	2508
DEBSEXP	215	8.50	10.15	.47	79.83
DEBGDP	215	73.33	85.11	4.32	715.9
INS	215	-.65	.58	-1.83	.84
GDPC	215	1568	2056.	4	10019
ODA	215	11.18	12.28	.2266	119.61
URB	215	36.98	15.78	8.46	86.64
POP	215	3.24	.93	2.20	8.92

Pane B Correlation Matrix

	HEXP	DEBEXP	DEBSEXP	DEBGDP	INS	GDP	ODA	URB	POP
HEXP	1.0000								
DEBEXP	-0.1034	1.0000							
DEBSEXP	-0.0434	0.6442	1.0000						
DEBGDP	-0.1782	0.6003	0.3570	1.0000					
INS	0.2881	-0.2325	0.1083	-0.2235	1.0000				
GDP	-0.1238	-0.2520	-0.0344	-0.1894	0.4920	1.0000			
ODA	0.1802	0.4495	0.4466	0.5452	-0.1085	-0.3705	1.0000		
URB	-0.2543	-0.1502	-0.0259	0.0889	0.2652	0.5826	-0.1119	1.0000	
POP	-0.1107	-0.0681	0.0775	0.0437	0.5039	0.6765	-0.1361	0.4219	1.0000

Notes: HEXP= Health Expenditure, DEBGDP=Debt to GDP Ratio, DEBEXP= Debt to Export Ratio, DEBSEXP= Debt service to Export, GDP= Real Per Capita Income, ODA= Official Development Assistance, URB=Urbanization, POP=Percentage of Population 65 years and above, INS=Institutional Quality.

3. Estimation Results

Table 2 is the estimate of equation (1) using the debt-to-GDP ratio, debt service-to-export ratio, and debt-to-export ratio as the alternative proxies to capture the public debt burden. Generally, the coefficient of the impact of public debt burden as measured by debt service-to-export ratio, debt-to-export ratio, and debt-to-GDP ratio are negatively and statistically significant on health expenditure in all the models. This indicates that an increase in public debt burden shifts the government budgetary allocation against the health care financing. Therefore, the mounting debt

burden of SSA is one of the leading cause of the extremely lower level of public health expenditure in SSA. This result concurs with the previous findings (Lora & Olivera, 2006, 2007; Mahdavi, 2004) that public debt burden negatively affects government spending on social expenditure.

Moreover, the coefficients of all the other determinants of public health expenditure used as the explanatory variables in the studies are found to be consistent with the theory across the models. The positive and statistically significant impact shown by the real income per capita, official development assistance and institutional quality indicates that all thing being equal, a country with a high-income level, more official development assistance, and good institutions tends to allocate more financial resources to improve health care financing and this increase the level of public health expenditure. This is in contrast to the negative coefficient shown by the urbanization and percentage of the population 65 years and above. It shows that all thing being equal, an increase in urbanization and the percentage of the population 65 years and above induces more demand for health care financing and thus negatively affects public health expenditure.

Table 2: Public Debt Burden and Health Expenditure Relationship

Independent Variables	(1) IHEXP	(2) IHEXP	(3) IHEXP
L.HEXP	0.162*** (6.13)	0.117*** (3.71)	0.0935* (2.68)
lnDEBSEXP	-0.0236* (-2.23)		
lnDEBEXP		-0.00139** (-2.76)	
lnDEBGDP			-0.00636*** (-6.35)
lnGDPC	0.000423** (2.17)	0.000330* (1.85)	0.000313*** (1.66)
lnODA	0.0666*** (7.67)	0.0657*** (13.11)	0.0799*** (9.96)
lnURB	-0.0830*** (-5.21)	-0.0808*** (-5.04)	-0.0764*** (-4.53)
lnPOP	-0.709** (-2.46)	-0.663* (-2.21)	-0.597** (-2.04)
lnINS	1.781*** (5.81)	1.789*** (4.72)	1.811*** (4.72)
CONSTANT	14.12*** (14.08)	14.68*** (13.05)	14.48*** (12.55)
<i>Observations</i>	172	172	172
<i>Instruments</i>	35	35	35
<i>Group</i>	43	43	43
<i>AR(1)</i>	0.042	0.032	0.052
<i>AR(2)</i>	0.113	0.139	0.141
<i>Hansen</i>	0.131	0.139	0.139

Note: *t* statistics in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

HEXP= Health Expenditure, DSEXP= Debt service-to-Export ratio, DEXP= Debt-to-Export ratio, DGDP= Debt-to-GDP ratio, GDP= Real Per Capita, ODA= Official Development Assistance, URB=Urbanization, POP=Percentage of Population 65 years and above, INS=Institutional Quality.

Table (3) is the estimated result of the equation (2), which investigates whether the impact of the public debt burden on health expenditure will change when the institutional quality improved. The coefficient of the interaction term of debt-to-export ratio, debt service-to-export ratio and debt-to-GDP ratio with institutional quality shown a positive sign across the models. This shows that the impact of public debt burden on health expenditure turns out to be positive with improvement in institutional quality. Therefore, the inclusion of institutional quality on public debt burden and health expenditure model provides the evidence of a reform complementarity, which shows that the negative impact of public debt burden on health expenditure diminishes or even reverse when the quality of institution improves. This infers that to efficiently utilize public and avert its needless implication on government budgetary allocations to health

care financing institutional quality improvement is necessary. This concurs with the recent findings (Bousmah et al., 2016; Makuta & O'Hare, 2015) that concludes health care financing efficiency depends on the quality of the institutions in the country.

Table 3: Institutional Quality and Public Debt Burden-Health Expenditure Relationship

Independent Variables	(1) IHEXP	(2) IHEXP	(3) IHEXP
L.IHEXP	0.636*** (12.11)	0.625*** (13.36)	0.697*** (12.76)
IDEBSEXP	-0.0500* (2.27)		
IDEBSEXP*INS	0.0559** (2.78)		
IDEBEXP		-0.00337*** (4.76)	
IDEBEXP*INS		0.00401*** (5.84)	
IDEBGDP			0.0107 (2.01)
IDEBGDP*INS			0.00746* (2.13)
IGDPC	0.000573* (1.85)	0.000904** (3.31)	0.000835*** (3.91)
IODA	0.0582*** (7.75)	0.0662*** (9.49)	0.0459*** (5.55)
IURB	-0.0610** (-3.03)	-0.0862*** (-4.63)	-0.0666*** (-5.14)
IPOP	-0.526* (-1.96)	-0.532* (-2.28)	-0.624* (-2.47)
INS	0.314** (-0.65)	0.867* (-1.72)	0.691* (-1.27)
Constant	6.311*** (5.76)	6.493*** (6.92)	5.422*** (4.68)
<i>Observations</i>	172	172	172
<i>Instruments</i>	33	33	33
<i>Group</i>	43	43	43
<i>AR(1)</i>	0.002	0.002	0.002
<i>AR(2)</i>	0.133	0.147	0.153
<i>Hansen</i>	0.244	0.301	0.312

Note: *t* statistics in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

HEXP= Health Expenditure, DSEXP= Debt service-to-Export ratio, DEXP= Debt-to-Export ratio, DGDP= Debt-to-GDP ratio, GDP= Real Per Capita, ODA= Official Development Assistance, URB=Urbanization, POP=Percentage of Population 65 years and above, INS=Institutional Quality.

Table 4 shows that the marginal effects of public debt burden on health expenditure fundamentally differ at the different level of institutional quality. The empirical results show that while the impact of the public debt burden is negative on health expenditure when the institutional quality is at a minimum, it is insignificant at an average level of institutions and significantly positive at the maximum level of institutional quality across the models. This result suggests that the impact of public debt burden on health expenditure is conditioned on the quality of the institutions. This conforms to the previous studies (Daud & Podivinsky, 2014; Presbitero, 2008) that argued that to a great the impact of public debt depends on the quality of the institution in the country.

Table 4: Marginal Effects of Public Debt Burden on Health Expenditure

Measurement of Debt Burden	Marginal Effects when Institutions at Minimum	Marginal Effects when Institutions at Average	Marginal Effects when Institutions at Maximum
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Debt Service-to-Export Ratio	(-.0522)** .0162	(.0136) .0099	(.0969)** .0386
Debt-to-Export Ratio	(-.0039)*** .0006	(.0007)* .0003	(.0067)*** .0012
Debt-to-GDP Ratio	(-.0029)** .0015	(.0058) .0031	(.0169)** .0082

Note: The standard errors are in parenthesis and calculated as proposed by Brambor et al., (2006) ***, **, * denote 1%, 5%, and 10% levels of significance.

Robustness check

Robustness check was conducted using the out-of-pocket health expenditure as an alternative measure to the level of health expenditure in the region. The results provide a solid backing that the relationship between the public debt burden and health care financing in SSA at both the public and private level is negative.

4. Conclusion and Recommendations

This paper examined the relationship between public debt burden and health expenditure on a sample of 43 SSA countries from 2000–2014. Using the Generalized Method of Moment (GMM) approach, the paper confirms that the relationship between public debt burden and health expenditure in SSA is negative. Interestingly however, the marginal effects of institutional quality confirms that such a negative relationship becomes positive when the institutional quality is at maximum. This result is consistent with the recent finding that to exploit the unwavering benefits of public debt and avert its needless implications, comprehensive improvement of institutional quality is necessary. This is because, while poor institutions have the tendency to divert the borrowed funds to a potentially meaningless project, good institutions properly manage the debt. To improve the level of public health expenditure in SSA countries, governments should not only minimize their over-dependence on public debt but also take a determined stand to improve the quality of their institutions comprehensively. This minimizes their public debt burden and forestalls its needless implications on the economy and health expenditure in particular.

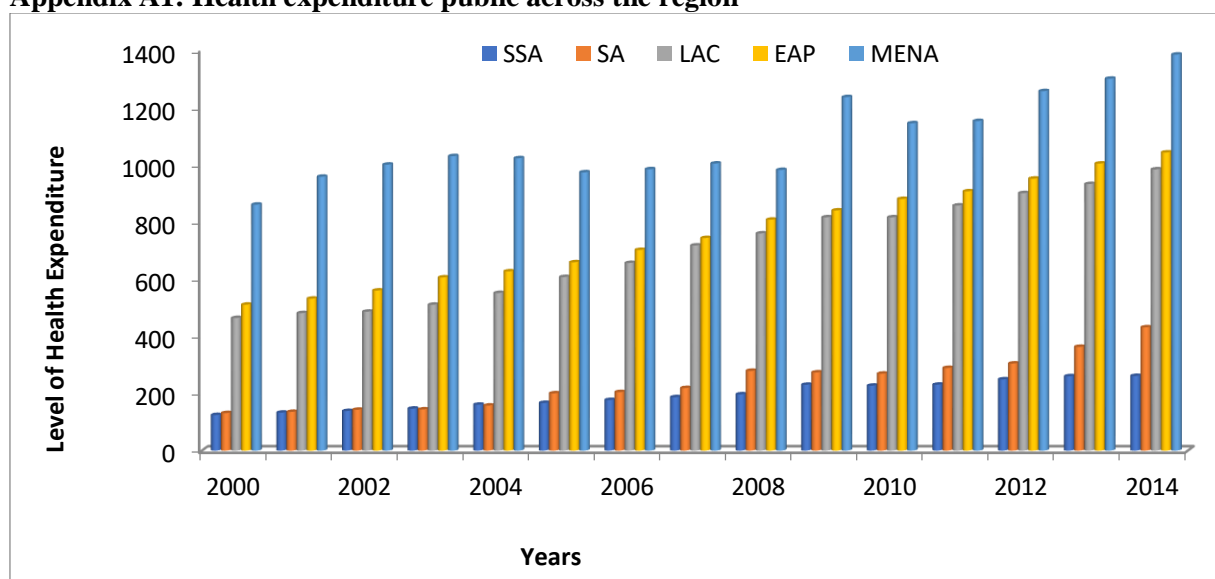
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Appendix A1: Health expenditure public across the region



Source: World Development Indicators

Note: SSA= Sub-Saharan Africa, SA= South Asia, LAC= Latin America and Caribbean, EAP=East Asia and Pacific, MENA= Middle East and North Africa.

Appendix A2: Lists of the countries used for the study

Angola	Congo (Dem. Rep)	Madagascar	Senegal
Benin	Ethiopia	Malawi	Sierra Leone
Botswana	Eritrea	Mali	South Africa
Burkina Faso	Gabon	Mauritania	Sudan
Burundi	The Gambia	Mauritius	Swaziland
Cameroon	Ghana	Mozambique	Tanzania
Cape Verde	Guinea	Namibia	Togo

Central African Rep.	Guinea-Bissau	Niger	Uganda
Chad	Kenya	Nigeria	Zambia
Comoros	Lesotho	Rwanda	Zimbabwe
Congo (Brazzaville)	Liberia	Sao Tome & Principe	

Appendix A3: Variables, measurements and source of data

Variables	Measurement	Source
Health expenditure	Health expenditure public as percentage of government expenditure	WDI
Debt-service-to Export	Measured in percentage in percentage	WDI
Debt-to-export	Measured in percentage in percentage	WDI
Debt-to-GDP	Measured in percentage in percentage	WEO
Income	Income Per capita constant (2010 US\$)	WDI
Foreign assistance	Net official development assistance as percentage of GNI	WDI
Urbanization	Percentage of total population living in urban areas	WDI
Population age	Percentage of population 65 years and above	WDI
Institutions	Score of -2.5 to 2.5	WGI

WDI: World Development Indicators (World Bank database)

WEO: World Economic Outlook (IMF Database)

WGI: Worldwide Governance Indicator (World Bank database)