

Explaining Out-of-Pocket Health care Expenditure in Sub-Saharan Africa: Evidence from Panel Data Analysis

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ABSTRACT

Motivated by the remarkable increases in the private health spending in Sub-Saharan Africa (SSA), this study aims at examining the factors that influence out-of-pocket health expenditure (OOPHE) in the region. The study also investigates the factors that push OOPHE to reach catastrophic levels. The study applies dynamic panel data method for a sample of 40 SSA countries over the period 1995-2014. The results indicate that economic factors such as per capita income, trade openness and inflation have significant effects on out-of-pocket health expenditure. The results also show that the expansion in urbanization pushes OOPHE to become catastrophic. Moreover, the morbidity factors such as the prevalence of anemia and tetanus diseases among under-five children boost OOPHE and raise the likelihood for incurring catastrophic health expenditure (CHE). Conversely, the increases in government expenditure lower the probability of undertaking OOPHE. Furthermore, the impact of accountability on OOPHE is found to be negative and statistically significant, indicating that the institutional quality decreases OOPHE and prevents it from reaching catastrophic levels.

ملخص

بدافع من الزيادات الملحوظة في الإنفاق الصحي الخاص في أفريقيا جنوب الصحراء الكبرى (SSA)، تهدف هذه الدراسة إلى التمييز في العوامل التي تؤثر على الإنفاق الصحي من الأموال الخاصة (OOPHE) في المنطقة. وتبحث الدراسة أيضا في العوامل التي تدفع بالإنفاق الصحي من الأموال

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الخاصة للوصول إلى مستويات كارثية. وعليه، تطبق الدراسة طريقة البيانات الديناميكية لعينة من 40 دولة في أفريقيا جنوب الصحراء خلال فترة 1995-2014. وتشير النتائج إلى أن العوامل الاقتصادية مثل دخل الفرد والانفتاح التجاري والتضخم لها تأثيرات كبيرة على الإنفاق الصحي من الأموال الخاصة. كما تظهر النتائج أيضا أن التوسع الحضري يدفع بالإنفاق الصحي من الأموال الخاصة إلى أن يصبح كارثيا. وعلاوة على ذلك، فإن عوامل المرض مثل انتشار فقر الدم وأمراض التيتانوس بين الأطفال دون سن الخامسة تعزز الإنفاق الصحي من الأموال الخاصة وتزيد من احتمال تكبد نفقات صحية كارثية (CHE). وفي المقابل، فإن الزيادات في الإنفاق الحكومي تقلل من احتمالية القيام بالإنفاق الصحي من الأموال الخاصة. وبالإضافة إلى ذلك، وجد أن تأثير المساءلة على الإنفاق الصحي من الأموال الخاصة سلبى وذو دلالة إحصائية، مما يشير إلى أن الجودة المؤسسية تقلل من هذا الإنفاق وتمنعه من الوصول إلى مستويات كارثية.

ABSTRAITE

Motivée par l'augmentation remarquable des dépenses de santé privées en Afrique subsaharienne (ASS), cette étude vise à examiner les facteurs qui influencent les dépenses de santé personnelles (DPS) dans la région. L'étude examine également les facteurs qui poussent OOPHE à atteindre des niveaux catastrophiques. L'étude applique la méthode des données de panel dynamiques pour un échantillon de 40 pays d'Afrique subsaharienne sur la période 1995-2014. Les résultats indiquent que les facteurs économiques tels que le revenu par habitant, l'ouverture commerciale et l'inflation ont des effets significatifs sur les dépenses de santé. Les résultats montrent également que l'expansion de l'urbanisation pousse OOPHE à devenir catastrophique. En outre, les facteurs de morbidité tels que la prévalence de l'anémie et des maladies tétaniques chez les enfants de moins de cinq ans augmentent l'OOPHE et la probabilité d'encourir des dépenses de santé catastrophiques (CHE). En revanche, l'augmentation des dépenses publiques diminue la probabilité d'entreprendre une OOPHE. En outre, l'impact de la responsabilité sur l'OOPHE s'avère négatif et statistiquement significatif, ce qui indique que la qualité institutionnelle diminue l'OOPHE et l'empêche d'atteindre des niveaux catastrophiques.

Keywords: Out of pocket, health expenditure, Sub-Saharan Africa, panel data

JEL Classification: I2, I3, C23, N37

1. Introduction

Access to healthcare service has been regarded as a crucial element in achieving human welfare and economic development. This is particularly evident in developing countries' contexts, where a large segment of the population lives below the poverty line, vulnerable to diseases and lacks effective social protection mechanisms. In these contexts, healthcare provision is usually financed through several means, including government budgets, health insurance, foreign aid, charitable bodies, and out-of-pocket health expenditure³. However, although all these funding methods are well-acknowledged, out-of-pocket health expenditure (OOPHE) remains the main method to finance healthcare in developing countries. The dominance of this method of funding exerts a devastating impact on the household's budget. Several studies have documented that OOPHE pushes a considerable portion of the population into poverty, and thus, increases the number of poor among the population in developing countries (Wagstaff and van Doorslaer, 2003, Xu et al. 2005, and Ebaidalla and Ali, 2019).

In SSA region, financing healthcare represents one of the troubling issues that confront policymakers. The adoption of structural adjustment programs (SAP) during the early 1990s in majority of the African countries has led governments to cut social spending, particularly on healthcare services. Consequently, a large portion of the population is forced to pay healthcare bills from their resources in the form of out-of-pocket health expenditure (OOPHE). As a result, SSA registers high levels of OOPHE, exceeding the global average. The recent statistics indicate that the average of OOPHE in SSA represents about 60% of the total private expenditures (World Bank, 2017). On the other hand, the statistics show that the key indicators of healthiness in the region are lagging behind compared to other regions in the world. According to the 2014's World Health Organization' Report, 90% of the worldwide malaria cases have occurred in SSA. The region also hosts the highest neonatal death rates in the world and of the 20 nations with the highest maternal mortality rates in the world, 19 were in Africa (World Health

³ Out of pocket expenditure is any direct outlay by households, including gratuities and in-kind payments, to health practitioners and suppliers of pharmaceuticals, therapeutic appliances, and other goods and services whose primary intent is to contribute to the restoration or enhancement of the health status of individuals or population groups. It is a part of private health expenditure (World Bank, 2017)

Organization, 2014). Likewise, although Africa constitutes only 11% of the world population, it hosts 60% of HIV carriers. On the whole, the cuts in public health provision, coupled with the absence of effective preventive health measures, are expected to boost OOPHE to the levels that obstruct people livelihoods.

Based on the above backdrop this paper aims at investigating the factors that influencing out-of-pocket health expenditure (OOPHE) and catastrophic health expenditure (CHE) in SSA. To the best of our knowledge, there are no empirical studies on this issue have been conducted using panel data, as most of the previous studies have used cross-sectional data (i.e. household surveys). The study applies a dynamic panel data for a sample of 40 SSA countries over the period 1995-2014.

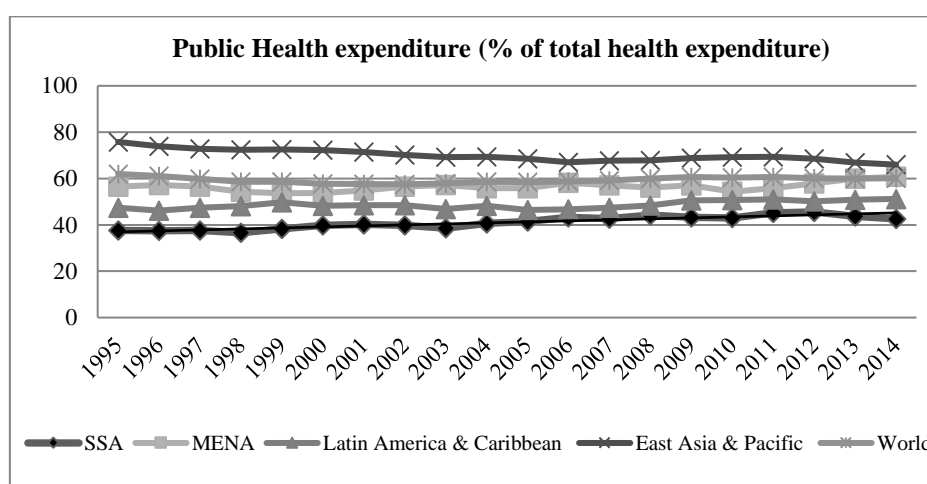
The remainder of this paper is organized as follows. Section Two presents some stylized facts about healthcare financing in SSA with some comparisons from other developing regions. Section Three reviews the relevant literature. Section Four outlines the data and methodology. Section Five presents empirical results and discussions. Section Six summarizes the findings and concludes.

2. Some Stylized Facts about Health Care Finance in SSA

Before examining the determinants of out-of-pocket health expenditure (OOPHE) and catastrophic health expenditure (CHE), it would be useful to shed some lights on the patterns of health expenditure and health care finance in SSA. In fact, the dismal health outcomes in the region signify the weakness of healthcare finance. Figure 1 below highlights the public health expenditure (% of total health expenditure) in SSA and some developing regions. As can be seen from the Figure SSA records the lowest public health expenditure during 1995-2014. Moreover, public health expenditure in SSA is lower than the global level. The Figure also reveals that public health spending as a percentage of total health expenditure was fluctuating at around 40% which indicates the weakness in public spending on health. However, during the last years, this expenditure has declined remarkably the matter that may be attributed, in part, to the incidence of the international financial crises. Generally speaking, the low public health expenditure implies that a considerable portion of health payments is paid by households. The continuity of such situation is likely to push OOPHE to grow at rates that are beyond the

financial capabilities of population. Eventually, this reality generates negative consequences on the levels of health outcomes in the region as increases in out-of-pocket health expenditure (OOPHE) cuts people’s expenditure on other life-sustaining items, such as education and food.

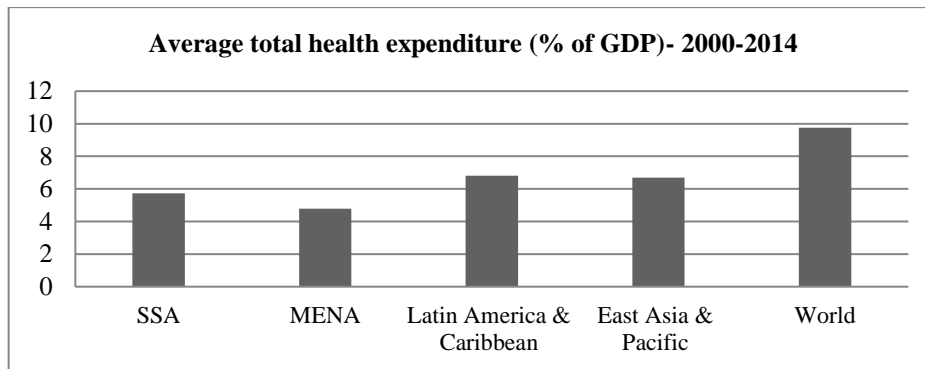
Figure 1: Public Health expenditure (% of total health expenditure) in SSA and other comparable regions - 1995-2014



Source: World Bank, World Bank Indicators (2017)

Figure 2 displays the state of public health expenditure (% of GDP) in SSA, MENA, Latin America and the Caribbean, East Asia and Pacific regions, over the period 2000-2014. As can be observed during the last two decades, SSA holds the lowest total health expenditure (%GDP) after the MENA region. Equally interesting, this share is extremely low compared to the global level. This relatively low level of publicly funded health spending has been observed although the majority of the population in the region exposes to poor health status.

Figure 2: Total Health expenditure (% of GDP) in SSA and other comparable regions - 2000-2014



Source: World Bank, World Bank Indicators (2017)

3. A brief Literature Review

The determinants of out-of-pocket health expenditure (OOPHE), in general, and catastrophic health expenditure (CHE), in particular, have received a great attention from researchers. Nevertheless, large part of the literature on this issue is based on the household surveys and country level data, while the cross-country's investigation is very scanty. Several empirical studies have shown that incurring OOPHE depends on a number of factors including, socio-economic factors, health status of the population, and the nature of the health system governs health care provision. For example, Xu et al (2011) examined the factors affecting total health expenditure, government health expenditure, and OOPHE in a set of developing countries. The authors applied both fixed effects and dynamic models to a panel data sourced from 143 developing countries over the period 1995-2008. Their results indicate that there is a great across countries variation in total health expenditure as a share of GDP. They documented that the impact of income on this branch of health spending is positive and statistically significant in all country-income groups. Moreover, the authors found that in low-income countries, the effect of Tuberculosis (TB) on OOPHE was positive and significant. They also showed that the population over 60 years is found to be positively associated with OOPHE only for the upper-middle income countries. Regarding the impact of health system characteristics, their results showed that there were no differences between tax, social health

insurance, and mixed systems on OOPHE. Compared to insurance-based systems, in the static model, the tax-based and mixed systems were found to have a positive association with OOPHE in lower-middle income countries. Moreover, the authors found that government expenditure as a share of GDP had no significant impact on OOPHE.

Several empirical studies have argued that the nature of health system represents a significant factor in determining health expenses. For example, the availability of health insurance coverage was found to be a critical determinant for health spending (Jowett et al., 2003; Spaan et al., 2012; Wirtz et al., 2012; Brown et al., 2014). Nevertheless, some empirical studies have underestimated the role of health insurance in protecting population from undertaking high OOPHE.

The literature shows that OOPHE turns out to be catastrophic after exceeding a certain threshold (Xu et al, 2003b and Wagstaff and van Doorslaer, 2003). Similar to OOPHE, factors such as household's socio-economic status, health status and the nature of health systems were also found to be responsible for incurring CHE. In particular, health care services utilization, capacity to pay, poverty, lack of health insurance coverage and fees levied at public health facilities were found to be among the factors that push OOPHE to reach catastrophic levels (Xu et al., 2003a; O'donnell et al., 2008; Yardim et al., 2010, and Rahman et al., 2013).

Many researchers have also confirmed that expanding health insurance coverage represents one of the decisive factors to protect people from financial catastrophe caused by higher health spending (Kavosi et al., 2012; Akinkugbe, 2012 and Devadasan et al., 2007). However, some researchers noted that the contribution of health insurance to reduce catastrophic health payments decreases significantly for a country with a great number of elderly, having chronic illnesses or disability and experiencing hospitalization.

Furthermore, the existing literature emphasizes that OOPHE can be also attributed to causes relatable to the country' health status. The argument is that the presence of chronic diseases pushes the population to spend continuously on medical services and, thus, generates financial catastrophe. In an empirical sense, the positive influences of health status

on citizens' CHE have been acknowledged by many scholars (e.g. Su et al., 2006; Abegunde and Stanciole, 2008).

The above discussion has made clear that the literature on the determinants of OOPHE and CHE is extensive and diverse. These determinants range from household socioeconomic characteristics to health system performance and economic indicators. However, most of the previous studies have focused on household surveys and there is very scant research on this issue using panel data techniques. Moreover, a distinguishing feature of this study would be its contribution to the literature by developing a measure for CHE in the context of panel data, as the existing literature (e.g. Wagstaff and van Doorslaer, 2003 and Xu et al. 2005) measures it for households using cross-sectional data.

4. Data and Methodology

4.1 Data

The study uses annual data for a sample of 40 Sub-Saharan African countries over the period 1995-2014. The data on health expenditure and health systems financing information is sourced from the National Health Accounts (NHA) database of the World Health Organization. The economic and demographic variables are gathered from several sources including the World Bank's development indicators and IMF Financial Statistics (IFS). Data on educational attainment is sourced from Barro and Lee database. Finally, we use the accountability index as a proxy for institutional quality. This index is obtained from the Varieties of Democracy Database (V-Dem).

4.2. Models Specification

To investigate the determinants of OOPHE and the factors that make it catastrophic, the study applies two regression models. First, to estimate the factors affecting OOPHE in SSA, the study employs a panel data technique to control for unobserved heterogeneity. The general notation for the model to be used can be specified in general form as follows:

$$y_{it} = \alpha y_{i,t-1} + \beta X_{i,t} + \eta_i + \mu_t + \varepsilon_{it} \quad (1)$$

Where y_{it} is the dependent variable in country i at time t ; X is a vector of explanatory variables; and α and β are parameters to be estimated. The

terms η_i and μ_t are time specific and country-specific effects, respectively; which are assumed to be independent and identically distributed (iid) over the countries and all time periods. Finally, the term ε_{it} is the error term.

Following the arguments of the previous studies on OOPHE, such as Xu et al (2011) and Wagstaff and van Doorslaer (2003) the model used to investigate the determinants of OOPHE in SSA can be specified as follows:

$$\text{OOPHE}_{it} = \beta_0 + \beta_1 \text{Eco}_{it} + \beta_2 \text{Soc}_{it} + \beta_3 \text{Health}_{it} + \beta_4 \text{Inst}_{it} + v_{it} \quad (2)$$

Where OOPHE_{it} is the dependent variable, captures out-of-pocket health expenditure as a percentage of total private health expenditures. The OOPHE variable is related to a set of explanatory variables including, economic, social, health system and institution characteristics of the country. The economic variables include per capita GDP, inflation, government expenditures, aid, and trade openness. The social characteristics include educational attainment, the level of urbanization, percentage of population under 15 years, percentage of the population between 15 and 64 years old and percentage of population above 65 years. The set of the country health characteristics include the prevalence of diseases, such as AIDS and Anemia among children. The health system factors are represented by health insurance coverage. The definition and the summary statistics of these variables are presented in Appendix I. Finally, the error term v_{it} in equation (2) is a composite disturbance term that includes an unobserved country-specific effect η_i and a time-specific effect μ_t as specified in equation (1).

Second, the study estimates a separate model to investigate the determining factors of catastrophic health expenditure (CHE). Following the lead of previous studies (e.g. Xu et al. 2003a, O'Donnell et al., 2008 and Ebaidalla and Ali, 2019), the CHE is defined as share of OOPHE from private health expenditures that equals or exceeds the two predetermined levels (thresholds), 30% and 50% of the population's capacity to pay. We follow Xu et al. (2005) and Wagstaff and van Doorslaer, 2003) in using a country's per capita private out of pocket health expenditures as an indicator for population capacity to pay. Thus, the model pertains to the determinants of CHE can be given by:

$$CHE_{it} = \beta_0 + \beta_1 Eco_{it} + \beta_2 Soc_{it} + \beta_3 Health_{it} + \beta_4 Inst_{it} + \beta_5 FER_{it} + \tau_{it} \quad (3)$$

Where CHE_{it} is CHE as measured by the share of OOPHE from private health expenditures in each country. The explanatory variables affecting CHE are indistinguishable from the factors that influence OOPHE in equation (2). Thus, the definitions of these variables remain as demarcated before.

4.3. Estimation strategy

To estimate the above two models, we use different estimation strategies. We use the panel data technique to estimate the first model, which focuses on the factors affecting the OOPHE. However, the possible endogeneity of regressors as well as the correlation of the unobserved country fixed effects with the error term implies that the orthogonality condition is not likely to be met for fixed effects (FE) or random effects (RE) estimator and; thus, may fail to produce consistent estimates. To account for the endogeneity of regressors, the appropriate method is to use instrumental variables (IV) estimator. Therefore, this study uses dynamic panel models based on the Generalized Method of Moments (GMM), developed by Arellano and Bond (1991).

The GMM dynamic method has many advantages over the conventional static panel data methods of the fixed effects and random effects models. First, the GMM model takes into account the time-series dimension of the data and, hence, it considers the short run effect. Second, it includes the non-observable country-specific characteristics. Finally, the GMM method treats all the explanatory variables as endogenous variables; hence it takes into account the potential problem of the endogeneity that may result from the correlation between the error term and the lagged dependent variable.

In literature, there are two methods of GMM models that have been widely used in estimating panel data regressions: the first-difference GMM estimator, developed by Arellano and Bond (1991) and the system GMM estimator, developed by Arellano and Bover (1995) and Blundell and Bond (1998). However, the literature has shown that there are some possible statistical problems associated with the use of the first-difference GMM estimator (Bond et al., 2001). That is, when the regressors are highly persistent, the instrumental variables used in difference GMM such

as lagged levels of the dependent variable and the explanatory variables might be weak instruments. In this situation, the first-differenced GMM model potentially suffers from a downward bias, especially when the time period (T) is small (Blundell and Bond, 1998). On the other hand, the system GMM estimator overcomes the weak instrument problem by allowing the use of the lagged differences and lagged levels of the explanatory variables or other variables as instruments. Therefore, the empirical analysis in this study relies solely on the system GMM technique.

The System GMM estimators are derived from the estimation of a system of two simultaneous equations, one in levels (with lagged first differences as instruments) and the second in first differences (with lagged levels as instruments). However, one possible problem that might arise when applying the system GMM is the invalidity of the lagged differences of the explanatory variables as instruments. Therefore, we examine the validity of the instruments by two tests: Sargan test of over-identifying restrictions, and Arellano and Bond (AB) test of serial correlation. Beside, the study tests the endogeneity problem applying Durbin (1954), Wu (1974) and Hausman (1978) endogeneity test.

On the other hand, the second model addresses the question about the determinants of CHE. Since the dependent variable is dichotomous (i.e. takes one if OOPHE exceeds the predetermined threshold level and zero otherwise), we use the dynamic random-effects probit model to estimate equation (3). We use the random effects model in the case of dynamic models with large sample (N) and short time period (T) as in our case because fixed effects generate inconsistent estimates as differencing out ε produces a linear regression model with lagged dependent regressors and serially correlated disturbances (Maddala, 1987).

5. Empirical Results and Discussion

This section presents the empirical results and discussion. The section is divided into two sub sections. Sub-section 5.1 reports some descriptive statistics about the dependent and independent variables. Sub-section 5.2 presents the estimation results of both OOPHE and CHE methods.

5.1. Descriptive Statistics

Before analyzing the factors that influence OOPHE and CHE, it is useful to briefly outline the pattern of the dependent variables (OOP health expenditure and catastrophic health expenditure) and the independent variables. Appendix I shows that the average out of pocket health payments is relatively high (40%), with higher standard deviation. This indicates that about 40% of health payments in SSA countries are paid by household's budget. The high variation in OOPHE also implies a high disparity in OOPHE across African countries. Likewise, the summary statistics in Appendix I shows that the proportion of households with catastrophic health spending is very high, reflecting the large out of pocket health payments in the region. Specifically, the mean of 30% and 50% threshold levels of CHE is about 70% and 50%, respectively; indicating large segment of population expose to catastrophic health spending. This also means that a considerable portion of household's budget in SSA goes toward health payments. Appendix I also reveals that there is a remarkable variation in the economic performance of SSA countries, as explained by high standard deviation of economic indicators such as GDP, inflation and the share of trade in GDP. Moreover, the descriptive statistics reveal low disparities in the demographic characteristics of households in SSA, as indicated by low standard deviation of population under five years and above 65 years. Moreover, the statistics show some relative variation across countries in terms of urbanization, and the distribution of public goods such as electricity, clean water and sanitation. Furthermore, the descriptive statistics point out some variations in health situation and spread of diseases such as tetanus, HIV and anemia. Finally, the summary statistics indicate that SSA countries exhibit high disparities in institutional quality as represented by accountability. On the whole, these variations in economic, health and demographic characteristics may explain the high disparities in OOPHE and CHE in SSA region as shown in Appendix I.

5.2. Determinants of OOPHE

Table 1 reports the estimation results of equation 2 using GMM method. Interestingly, most of the variables' coefficients come out with expected signs, statistically significant and of acceptable magnitudes. For instance, the coefficient associated with the lagged OOPHE is negative and

statistically significant, indicating that OOPHE of the last year has a great say in determining current year's OOPHE.

Expectedly, the coefficient of the GDP per capita variable is negative and statistically significant. This indicates that achieving higher levels of growth in GDP per capita lowers the incidence of OOPHE. This outcome has many interpretations. First, the increases in GDP per capita is likely to improve livelihoods, and, thus, improves population healthiness. According to the argument of the human development index, the higher the GDP per capita the better will be the health status of the people. Also increase in GDP per capita may support people to change their lifestyle, particularly the aspects related to sanitation and health preventive measures. Achieving advancements on these aspects would make people healthier and therefore, lower OOPHE. Second, the higher GDP per capita indicates that the GDP has expanded, which means a larger taxable base and, then higher public revenues.

The coefficient in front of inflation variable is negative and statistically significant, signifying that higher inflation rate is accompanied by a great drop in OOPHE. The interpretation of this outcome is straightforward. A higher inflation rate is likely to deteriorate people purchasing power and, as a result, lower their purchases from all items including health care services. Nevertheless, the high inflation rates may sometimes result from higher public spending funded by expanding the monetary base. In the short run, if a larger share of such spending is directed to upgrade public health facilities it will contribute greatly in shrinking OOPHE.

Unexpectedly, the coefficient of the humanitarian aid variable is found to be insignificant, indicating that foreign aid has no impact on OOPHE. However, this outcome can be interpreted based on the fact that in the last decades, foreign aid inflow into the region has contracted or at least became growing at stagnant rates. The World Bank statistics (2017) shows that starting from the year 2007 onward; the share of official development assistance (ODA) in SSA's GNI has dropped below the level of 4%. These descending trends in aid may, in part, be attributed to the incidence of the international financial crises that engulfed the world economy from 2008 onward. Moreover, the changes in donors' preferences can be also claimed for these significant reductions in aid disbursement. In the era of globally shared values and concerns, donors become prioritizing issues such as human rights, political freedoms, democratic commitments, and fighting terrorism. Unfortunately, the

attitudes of the majority of SSA countries towards these issues do not converge with those of the donors. The divergence in the views on these issues may decrease the amount of aid transferred to SSA. In addition, some authors have argued that the decline in ODA after 2000 may resulted from changes in donors' priorities as many of them turn out to donate for countries in transition as well as for the new countries emerged due to the disintegration of the former Soviet Union (Loxley and Sackey 2008).

The coefficient of the government expenditure variable appears with an insignificant sign indicating that public spending fails to lessen OOPHE. It is worth to mention that, many African governments use their scarce resources to conduct high expenditures on security agendas instead of spending on public utilities. Thus, the rise in the shares of governments spending from GDP leaves OOPHE unaffected. Interestingly, the results indicate that trade openness leads to significant increases in OOPHE. This can be inferred by the positive and significant coefficient associated with the trade variable. In part, this outcome can be explained by the fact that SSA governments adopt an open trade policy along with other packages of policies, including structural adjustment programs, privatization, and economic liberalization. Adopting these policies would certainly push governments to implement strict austerity measures and, as a consequence, cut expenditures on public facilities and encourage the private sector to involve in its provision.

The results show that the educational equality seems to have no effect on OOPHE. This may be attributed to the poor educational attainment among SSA population. Shifting to demographic factors, the reported findings show that increases in population members with an age that is greater than 65 years cause no evolution in OOPHE. This outcome can be interpreted by the fact that the life expectancy at birth in SSA is, on average, 61 years, indicating smaller proportion of elders among population (World Bank, 2017). Alternatively stated, the smaller portion of the population who live more than 60 years is quite low and, thus, it has no significant effects on OOPHE. Similarly, increases in the number of the population with an age lesser than 14 years are found to have no impact on OOPHE. It worth to mention that health matters related to this category of the population enjoys great attention from both local and international organizations. In other words, the provision of free healthcare facilities via these organizations reduces OOPHE that could be paid in the absence of these interventions.

The results also show that the coefficient of the urban population variable is significant and carries a positive sign, indicating that the growth in this category of population boosts OOPHE. This outcome is expected since the majority of SSA countries expose to huge waves of immigration from rural to urban areas. According to the World Bank's statistics, the percentage of the population who reside in urban areas in SSA grew from 14% in 1960 to 38% in 2016 (World Bank, 2017). This dramatic growth rates in urban residents are likely impose great pressures on health care services in urban areas and, as a result, increases OOPHE. Moreover, the positive and significant sign of the urban population variable may indicate that urban residents, compared to rural one, are more enlightened about health matters, seek high-quality health services and, therefore, expose to high health spending.

Table 1: GMM Estimates: The Determinants of OOPHE in SSA

The dependent variable: log OOPHE				
Variable	Coefficient	S. E	Z	P-value
OOPHE(-1)	0.8140***	0.0283	28.67	0.000
GDP	-0.1201***	0.0462	-2.60	0.009
Inflation	-0.0005**	0.0002	-2.07	0.038
Humanitarian aid	0.0003	0.0011	0.27	0.788
Government spending	0.0017	0.0023	0.74	0.458
Trade	0.0009***	0.0003	2.78	0.005
Educational quality	0.0555	0.0344	1.61	0.107
Population age >65	0.0197	0.0450	0.44	0.662
Population age <14	0.0051	0.0101	0.51	0.610
Urban	0.0074**	0.0030	2.44	0.015
Undernourished	-0.0008	0.0018	-0.43	0.667
Sanitation	0.0047**	0.0024	1.95	0.051
Water	0.0055***	0.0021	2.63	0.008
Electricity	-0.0028	0.0019	-1.45	0.146
Tetanus	-0.0018**	0.0009	-2.09	0.036
HIV	0.0247	0.0207	1.20	0.232
Anemia	0.0055***	0.0024	2.34	0.019
Accountability	-0.1363***	0.0506	-2.70	0.007
Constant	0.4777	0.6896	0.69	0.488

Note: ***, **, and * indicate significance at the 1, 5 and 10 percent levels, respectively.

The prevalence of undernourishment appears to have no effect on OOPHE. As can be indicated from Table 1, the coefficient of the variable is insignificant, indicating that undernourishment does not OOPHE. This outcome can be interpreted by the fact that undernourished people do not secure enough income to conduct health expenditures. This category of the population may resort to traditional healers or visit medical practitioners in health public facilities which provide free health services.

Interestingly, the coefficients of sanitation variable and water are both positive and statistically significant. These results, which oppose our prior expectations, may indicate that smaller proportions of the population are furnished with health-improving facilities. According to the World Bank (2017), only 29% of the SSA population has access to improved sanitation facilities, indicating the presence of poor sanitation in the region. This percentage drops to 23.30%, when rural residents are considered. Similarly, although SSA region is very rich in terms of waters resources, the percentage of the population with access to improved waters facilities is 67%, while it declines to 55% for rural population (World Bank, 2017). This reality would not reduce the waves of OOPHE being encountered by population, particularly rural residents. The accessibility to electricity predicts the same neutral effects on OOPHE. The variable coefficient is found to be insignificant even at a conventional level indicating no desirable effects on OOPHE.

Expectedly, expanding the coverage of immunization against tetanus among newborn children is found to exert a desirable impact on OOPHE. The coefficient of the tetanus variable is negative and statistically significant, indicating that application of tetanus vaccine to children leads to significant decreases in OOPHE. The growth in the number of new HIV infections among uninfected populations ages 15-49 is found to have no significant effect on OOPHE. The coefficient of the HIV variable, although it carries a positive sign, however, it is statistically insignificant. The possible interpretation for this outcome is that in the early period of HIV infection, infected persons are less likely to take medical treatments. Moreover, even for those who live in the maturity period of the virus and develop some complications such as exposure to opportunistic infections, the cost of treatments is mostly be paid by international organizations and local charities. The prevalence of Anemia among under-five children seems to lead to significant increases in OOPHE. This can be indicated by the coefficient associated with the anemia variable which is positive

and statistically significant demonstrating that the increases in the percentage of under-five children whose hemoglobin level is less than 110 grams per liter would raise OOPHE.

Remarkably, and most importantly, the coefficient in front of the accountability variable is negative and statistically significant, indicating the pivotal role of heightening accountability measures in shrinking OOPHE. This result may also support the argument which states that making government officials accountable for their actions and policies would improve the effective utilization of public resources. In other words sustaining accountability measures in public offices would secure the fair delivery of health care services and, thus, diminishes OOPHE.

5.3. The Determinants of CHE

Table 2 displays the estimation results of the random effect probit model pertains to the factors that push the share of OOPHE from private health expenditures exceeding 50% and 30% (i.e. $OOPHE \geq 50\%$ and 30% of private health expenditures). As the table shows, the coefficients of the explanatory variables generate different effects on the CHE than that we observe in the case of OOPHE. For instance, the coefficients associated with variables such as GDP per capita and inflation turns out to be statistically insignificant in CHE model.

Different from OOPHE estimates, the coefficient of government expenditures (% GDP) variable is found to be negative and statistically significant. This indicates that the increase in share of government expenditures in GDP decreases the probability of undertaking CHE. In contrast to the results reported in Table 1, the coefficient of trade variable is positive and statistically insignificant, indicating that the adoption of trade openness has on impact on the likelihood of undertaking CHE.

Dissimilar from the results reported in Table 1, the educational equality variable appears to have a positive effect on CHE. Specifically, the coefficient of the variable is positive and statistically significant. This indicates that achieving higher educational quality among population increases the likelihood of conducting CHE. The coefficients of the population with age greater than 65 and less than 14 years variables are similar to those displayed in Table 1. This indicates that the growth in these two categories of population has no significant effects on the

likelihood of incurring CHE. Unlike the findings obtained on the determinants of OOPHE, the variables of sanitation and water appear with negative and statistically significant coefficients. This implies that raising population's accessibility to improved sanitation and water facilities lower the probability of incurring CHE.

Table 2: Random Effect Probit Estimates: The Determinants of CHE in SSA (OOP>50 &>30)

Variable	50% Threshold CHE level	30% Threshold CHE level
GDP	0.7795 (1.2376)	1.832 (3.118)
Inflation	0.0066 (0.0114)	-0.005 (0.030)
Humanitarian aid	-0.0181 (0.0370)	0.025 (0.090)
Government spending	-0.1401* (0.0822)	0.025 (0.276)
Trade	0.0316 (0.0142)	0.013 (0.052)
Educational quality	3.1936** (0.9894)	6.549*** (1.639)
Population age >65	1.6176 (1.4674)	2.363 (2.322)
Population age <14	0.2732 (0.2103)	0.136 (0.606)
Urban	-0.0242* (0.0584)	-0.193 (0.118)
Undernourished	-0.0857 (0.0471)	-0.119 (0.131)
Sanitation	-0.1030** (0.0529)	-0.095 (0.118)
Water	-0.1136** (0.0511)	-0.188 (0.120)
Electricity	0.0733 (0.0522)	-0.138 (0.145)
Tetanus	-0.0048 (0.0321)	-0.104 (0.072)
HIV	-1.2385* (0.6996)	2.440 (1.564)
Anemia	0.0917** (0.0476)	0.438*** (0.135)
Accountability	-2.6429* (1.4080)	-10.99*** (3.962)
Constant	-10.386 (17.314)	8.48 (32.90)

Notes: ***, **, and * indicate significance at the 1, 5 and 10 percent levels, respectively. Values in parentheses are standard errors

In a complete conformity with the results obtained from the OOPHE model, the prevalence of anemia among under-five children increases the likelihood of incurring CHE. In contrast, the likelihood of experiencing CHE decreases with increases in the number of new HIV infections among uninfected populations. As mentioned previously, this outcome can be interpreted by the fact that health expenditures on HIV are mainly covered by health organizations.

The accountability variable carries a negative and statistically significant coefficient. This lends further support to the results reported in Table 1, confirming the effectiveness of accountability in mitigating the incidence of OOPHE in general and CHE in particular.

Turning to the factors that lead households to incur CHE at 30% threshold level, column three in Table 2 shows that the economic characteristics of the countries under consideration including GDP per capita, inflation and trade openness place no effect on the probability of undertaking CHE that equal or exceeds 30% of total private health expenditures. Similarly, the demographic factors such as population with ages greater than 65 and less than 14 years old, urban population, the presence of humanitarian aid have no impact on the probability of incurring CHE beyond the level that equals or exceeds this threshold.

With children infected by anemia as an exception, the morbidity characteristics are also found to have no effect on the probabilities of the population being burdened by CHE. As can be seen from column 3, the anemia children with anemia variable is found to be positive and statistically significant, indicating that the incidence of anemia disease among children increases the likelihood to undertake CHE that exceeds or equals to 30% of the total private health spending. In general, the positive and highly significant coefficients associated with this variable in the two models (i.e. 50% and 30% threshold levels of CHE) confirm that the incidence of this disease leads to CHE.

Similar to the findings of previous models, the coefficient of the accountability variable come up with a negative and statistically significant sign confirming the importance of institutional quality in determining the pattern of OOPHE in the region. Specifically, the negative and statistically significant coefficient accompanied this variable

indicate that of the level of accountability in SSA region lower the probabilities of undertaking CHE.

6. Conclusion and Policy Implications

This study aims at investigating the factors that lead the population in SSA to incur out-of-pocket health expenditure (OOPHE). The study also examines the factors that push normal OOPHE to become catastrophic. To this end, we apply both the Generalized Method of Moments (GMM) and random effect probit techniques to a panel data set pertain to 40 SSA countries spanning over the period 1995 to 2014. The results show that increases in GDP per capita and inflation rates reduce OOPHE. Conversely, the degree of trade openness is found to increase OOPHE. Yet, these economic factors have no significant effect on probabilities of pushing OOPHE to become catastrophic. With the growth in the urban population as an exception, the demographic variables such as the percentage of population with an age above 65 and under 15 years are found to have no significant effects on OOPHE. However, the increase in urban population generates significant increases in OOPHE, signifying the explosion in the urban population.

The results also show that the morbidity factors such as the prevalence of anemia and tetanus among children increase OOPHE. Specifically, the high incidence of anemia among children increases OOPHE and raises the probabilities for incurring CHE. The increases in government expenditures as a percentage of GDP although found to have no effect on OOPHE but it decreases the probability of undertaking CHE. Interestingly, in all models, the coefficients of the accountability variable are found to be negative and statistically significant. This indicates that sustaining higher level of accountability leads to significant decreases in OOPHE and prevents from incurring CHE.

Based on these findings, many recommendations can be suggested. First, policymakers should coin measures and strategies to protect population from the burden of OOPHE. These measures may include, but not limited to, the establishment of high-quality health facilities to achieve high health utilization. Second, health insurance schemes need to be expanded to cover large proportions of the population, especially those who belong to vulnerable categories. Third, the levels of accountability and governance in public offices need to be heightened to guarantee a fair

provision of healthcare services to the targeted population. Fourth, the policymakers need to work on sustaining a balanced regional development since this may lower the rates of immigration from rural to urban areas. Taking such policy action would minimize the pressures on health care facilities in urban centers and, therefore, lighten the burden of OOPHE. Finally, a wide range of healthcare services and nutrition programs need to be launched in order to cut the prevalence of diseases such as anemia and tetanus among newborn children in the region.

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Appendix I: Definition and Descriptive Statistics of the Variables to be used in the Regression Analysis

Variable	Definition	Mean	Std. Dev.
OOPHE	Out-of-pocket health expenditure (% of private expenditure on health)	39.4045	18.9379
30% CHE	1= if CHE equal or exceeds 30% and 0= otherwise	0.7249	0.2637
50% CHE	1= if CHE equal or exceeds 50% and 0= otherwise	0.5159	0.3878
GDP	Real gross domestic product (constant 2010, in U.S. million dollars)	24000	63700
Inflation	Inflation, consumer price (annual %)	22.8384	208.3946
Humanitarian aid	Humanitarian aid (% of GDP)	0.0062	0.0177
Government spending	Government spending (% of GDP)	15.3154	7.2377
Trade	Exports + imports (% of GDP)	77.7157	48.7472
Educational quality	Educational equality measures to what extent is high quality basic education guaranteed to all, sufficient to enable them to exercise their basic rights as adult citizens?	-0.1297	0.9437
Population age >65	Population ages 65 and above (% of total)	3.3406	1.0724
Population age <14	Population with ages under 14 as a percentage of the total population.	42.6779	5.2869
Urban	Rural population (% of total population)	63.8210	15.1061
Undernourished	Prevalence of undernourishment (% of population)	25.4613	13.7973
Sanitation	Improved sanitation facilities (% of population with access)	32.0273	21.9364
Water	Improved water source, urban (% of urban population with access)	66.4600	16.7131
Electricity	Access to electricity (% of population)	32.0119	25.2325
Tetanus	Newborns protected against tetanus (%). Newborns protected against tetanus are the percentage of births by women of child-bearing age who are immunized against tetanus.	73.7607	15.5645
HIV	Incidence of HIV (% of uninfected population ages 15-49. Number of new HIV infections among uninfected populations ages 15-49 expressed per 100 uninfected populations in the year before the period.	0.6406	0.8980
Anemia	Prevalence of anemia, children under age 5, is the percentage of children under age 5 whose hemoglobin level is less than 110 grams per liter at sea level.	66.6384	14.1277
Accountability	Accountability index which measures to what extent is the ideal of government accountability achieved?	0.4205	0.6636

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