

## Political Institutions, Economic Institutions, and Health Evidence from Sub-Saharan Africa

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**Abstract:** The paper investigates the effects of institutions on health in Sub-Saharan Africa. Unlike previous studies that focused on a single institution, we assume that several institutions improve health. We include four indicators of institution quality (i.e. democracy, regulation, property rights, and size of State) as explanatory factors for health in a sample of 22 countries over the period 2002-2016. The Two-Stage Least Square approach is privileged for estimations. The results show that institutions have positive effects on health in Sub-Saharan Africa. Three institutional indicators namely democracy, property rights, and regulation reduce the under-5-mortality rate. These results indicate that Sub-Saharan African countries should focus on strengthening democracy, property rights, and regulation by well-functioning of the legal and judicial system to boost health.

**Keywords:** Institutions, Health, under-5 mortality rate, Sub-Saharan Africa

### Introduction

Since Grossman (1972) the question of health as a source of labor productivity has been one of the central issues in economic research. Indeed, economic growth is observed in countries where the population lives for a long time. As an illustration, it is noted that low-income countries, particularly in Sub-Saharan Africa (SSA), have the highest maternal and infant mortality rates, respectively 542 per 100,000 in 2015 and 74 per 1000 births (OMS 2019). In 2012, the mortality rate per 1000 women aged 15 to 60 in low-income countries is about 3 times higher than in high-income countries, the respective rates are 230 and 67 (World Health Organization 2014). The situation in low-income countries, particularly those in SSA, will generate renewed interest in work on the determinants of individual health.

It is in this vein that some studies, in the wake of the New Institutional Economy, will identify institutions as a determinant of health (Gupta, Davoodi, and Tiongson 2001; Rajkumar and Swaroop 2008; Dianda and Ouedraogo 2021; Bella 2021; McGuire 2020). According to Van Arkadie (1989), institutions can be defined either by a structural approach precisely as an organization, for example, hospitals, drugstores; or by a functional approach, as North (1991) does, where they designate all the humanly constraints that determine social, political and economic interactions. Under this functional approach, institutions are multiple. They can be

grouped into two categories: formal institutions and informal institutions. Formal institutions designate all contracts, laws and written standards that structure the political, legal, and economic spheres. They are executed by the state and its administrations, they are written, explicit and they can be measured. Formal institutions are either political or economic (Acemoglu, Gallego, and Robinson 2014; Acemoglu, Johnson, and Robinson 2005; Acemoglu and Robinson 2010; OMS 2014). According to Rodrik (2000) economic institutions are diverse, in particular property rights, market regulation institutions (controls opportunistic, and deviant behavior of agents), and market stabilization institutions (size of State, fiscal policy etc.). Political institutions, for its part, are the source of economic institutions and designate the norms and rules that determine human interactions in the political sphere such as democracy, civil liberties, etc.

While previous studies seem to validate the importance of institutions on health. For example, Olafsdottir et al. (2011) in an analysis of 46 African countries using six multiple regression models show that the quality of governance is an important determinant of health system performance. However, van der Windt and Vandoros (2017) as well as Wise and Sainsbury (2007) after reviewing 34 studies that examine the relationship between democracy and health, show that this relationship is weak. Institutions are a multidimensional phenomenon ranging from the size of the State to the degree of democracy. Then focusing on one institution could be misleading and does not make it possible to define the whole concept. Besides using one institutional indicator while ignoring others can lead to omitted variables bias (Keho 2012; Fukuyama 2016).

To our knowledge, only Dianda and Ouedraogo (2021) have focused on the effects of institutional quality on health in Africa precisely in WAEMU. This study used a synthetic indicator des institutions which do not permit to test the individual effect of institutions on health. The present study contributes to the existing literature on the crucial importance of institutions' quality to test their individual effects on health in SSA. First, we provide macro-level evidence of the direct impact of institutions on health by using a broader set of institutions' quality, to test their individual effects on health. Second, most studies on the link between institutions and health fail to take into account the property rights that are present in institutional classification (North 1990; Rodrik 2000). Third, investigating institutions' indicators that affect health provides useful information for policymakers to prioritize which institutional reforms are for improving individual health in SSA. Fourth, we use Two-Stage Least Square (2SLS) method which provides consistent estimates it solves unobserved heterogeneity and simultaneity problem that is common in panel data.

Thus, the objective is to investigate the effects of institutions on health status in SSA. To achieve this, the next section deliberates on institutions and health in SSA. Section 3 reviews the existing literature. Section 4 presents methodology including econometric specification. Section 5 provides econometric results and discussion, and section 6 concludes and offers policy implications.

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1 Informal institutions are the unwritten norms and rules that determine human interactions such as customs, traditions, etc. (North, 1991).

## 2. A brief overview of institutions and health in SSA

It is noted that SSA countries have undertaken reforms to build better health conditions and institutions. Thus, 37 countries have recorded an improvement in their overall level of governance since 2006 (Fondation Mo Ibrahim 2016). For example, property rights have improved in 28 countries, with Kenya and Senegal perform best (Fondation Mo Ibrahim 2017). There is greater respect for human rights and the rule of law in Africa. In both areas, marginal progress has been noted: the human rights index rose from 48% in 2005 to 50% in 2007. Similarly, the rule of law index rose from 49% to 52% in the same period (CEA 2009). Despite the measures taken by governments to fight corruption, 89% of countries in the region scored below 50. This average score is 10 points lower than the global score (Transparency International 2016). Besides, the quality of policies and institutions in SSA deteriorated further in 2016, with an overall rating of 3.1 (Banque Mondiale 2017). Fondation Mo Ibrahim (2017) reports that over the period 2007-2016, public management is deteriorating at a slower pace due to the fiscal policy deteriorated by -1.23. 11 countries show an increased deterioration over the last five years e.g. Nigeria (-43.6), Gambia (-38.0), and Mozambique (-32.6). Worse institutional quality improves governments' rent-seeking and also improves the wasting of resources allocated to health (Acemoglu 2008; Dianda and Ouedraogo 2021).

In SSA, health is making progress. The average life expectancy at birth is 50 years in 1990 and 58 years in 2012. Since 1995, antiretroviral treatment has prevented 4.8 million deaths and reported new infections have declined by 38.5% over the period 2001-2012 (OMS 2014; Nations Unies 2015). Since 2000 increased use of insecticide-treated mosquito nets reduces for half of the parasite prevalence among children aged 2–10 years in SSA between 2000 and 2015 (OMS 2019). In 2015, 58% of the population has access to at least basic water (Banque Mondiale 2018). However, the area faces a shortage of health care supply in response to the ever-increasing demand. The ratio of physicians to the population (per 10.000) between 2006 and 2013 is 2.6. The area accounts for 80% of the 207 million malaria cases reported in 2012. In the same year, the region records 27% of the 1.3 million new cases of new infections of tuberculosis (Nations Unies 2015; OMS 2014). Only about 55% of births were assisted in 2013 in SSA, compared to 75% for emerging countries in the South Asia region (Banque Mondiale 2018). OMS (2019) reports that SSA remained the most heavily affected region, where 59% of the 980 000 new adult HIV infections were in women, and condom use among men at last sex with a non-regular partner was lower than 60%. Figure 1 depicts the comparison of life expectancy, incidence of tuberculosis, and infant mortality rate of SSA with other regions of the world. SSA has the lowest life expectancy and the highest incidence of tuberculosis and infant mortality rate.

For SSA to improve health, there must be increased effort to promote good institutions by improving the quality of political institutions that are the source of economic institutions (Acemoglu and Robinson 2010). Democratic institutions promote demand-driven policymaking by revealing preferences during elections. Also, secure property rights and fiscal policy can produce additional resources allocated to health care (Acemoglu, Johnson, and Robinson 2005; Allendorf 2007; OMS 2014). The health sector has many characteristics such as uncertainties, asymmetric information between dispersed actors (Arrow 1963). Thus, better regulatory institutions provide incentives for the economic agent to invest more in health by controlling asymmetric information in the health sector (Rodrik 2000; Bella 2021).

[Figure 1: Life expectancy, incidence of tuberculosis and infant mortality rate in the world]

### 3. Literature review

The economic analysis of the effects of institutions on health focused mainly on formal institutions, including economic and political institutions. About formal institutions, some work focused on economic institutions while others focused on political institutions. Different economic institutions affect health. Some studies will use egalitarian health theory to show that market stabilization institutions<sup>2</sup> according to Rodrik (2000) classification improve health. Klarman (1965) showed that government subsidies in the health sector have two objectives: reduce service costs and reduce disease risks. Royalty (2000) developed a theoretical model in which tax policy takes into account citizens' health insurance preferences and allowed taxes to finance health insurance. This is in line with the research of Arrow (1963) and Lafarge (1988), which showed that health insurance can be placed under state supervision. However, Filmer and Pritchett (1999), using World Bank data and Ordinary Least Squares (*OLS*), arrived at the result that public expenditures did not affect the under-5 mortality rate.

Starting from the observation that the exchange in economics takes place on the property rights of Alchian and Demsetz (1972), some researches show that property rights reduce transaction costs in a health system. Specifically, if a patient wishes to receive health care, property rights allow the patient to pay the agent who owns the service to obtain it. For example, in a health care system, pharmacologists have the right to sell drugs, the scientist who has discovered a drug molecule has the right to collect royalties (Milgrom and Roberts 1988; Williamson 2000). However, the introduction of private property rights can lead to health market failure. They can lead to a monopoly situation through patents imposed on the sale of drugs (Nogues 1993; Subramanian 1995). They may also increase transaction costs related to information asymmetries between patient and physician (Greenberg and Kamin 1993).

Besides, regulatory institutions affect the conditions for improving health. For example, institutions that control corruption provide vulnerable populations with access to health services. In this respect, Deininger and Mpuga (2005) showed using a theoretical model that controlling corruption reduces the diversion of funds in the health sector. McPake et al. (1999) showed that corruption is an obstacle to the achievement of the goal of equity by the health system. Azfar and Gurgur (2008) using 7 indicators of health service quality in the Philippines, showed that controlling corruption reduces waiting times for health services and increases vaccination rates. Rajkumar and Swaroop (2008) over three years 1990, 1997, and 2003, concluded that public spending is ineffective in improving health status in countries with high levels of corruption. These results are in line with the conclusions of Li et al. (2018) as well as Dimant and Tosato (2018).

Besides the influence of economic institutions, political institutions also have effects on health. At this level, the studies focused on democratic institutions and they examined relatively the effects of democratic and autocratic regimes. In the first case, democratic

<sup>2</sup> Market stabilization institutions bring together the fiscal and monetary instruments used by governments. These may include taxes, subsidies, public expenditures, etc. (Rodrik, 2000)

institutions make information available, which promotes a match between patient preferences and the services provided by physicians (Besley and Kudamatsu 2006; Lake and Baum 2001). Acemoglu, Johnson, and Robinson (2005) and Acemoglu and Robinson (2010) showed that political institutions create economic institutions that in turn will determine public policies such as health. Barnish, Tørnes, and Nelson-Horne (2018) using *OLS*, showed that democratic countries are those where the population is healthy because democratic institutions improve access to health care. This result is similar to Okada (2018). However, McGuire et al. (1993) concluded that the electoral system may be ineffective in promoting health. According to them, reality voters were imperfectly informed about policies that are alternatives to their well-being in addition to the fact that politicians did not have all the information about citizens' preferences. These results are in line with the conclusions of van der Windt and Vандoros (2017) in a study that revisits the relationship between democracy and health using micro-level household data from 816 randomly selected villages in Eastern Congo.

In the second case, the authors showed that the democratic system improves health status more than the autocratic system. The democratic system produces more public goods than autocratic ones because of the incentives imposed by the electoral process (Deacon 2009; Sen 1999). Meltzer and Richard (1981) showed that redistribution and investment in public services such as health increase more in democratic societies than in autocratic ones because they are linked to the preferences of the median voters who determine public policy. This result is similar to Niskanen (1997) finding that public services provided by the government in a democratic system are superior to those provided by the government in an autocratic system. However, Weingast and Marshall (1988) criticized these results. They showed that public policies are determined by conflicts such as efficiency, not by the type of political regime.

It emerges from an empirical perspective that many institutions affect health. Moreover, the problem of endogeneity precisely the simultaneity between institutions and health is sometimes neglected by the use of the standard estimation method such as Ordinary Least Squares by some works. Indeed, health also affects the quality of institutions (Acemoglu, Johnson, and Robinson 2001).

#### 4. Methodology

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

##### 4.1. Econometric model and variables

To investigate the effects of institutions' quality on health in SSA, we use the macroeconomic health production function developed by Fayissa and Gutema (2005). Thus, in order to take into account the lessons of the human capital and the new institutional economics, we add institutional indicators and other variables such as school enrolment, public expenditures as determinants of health. Unlike the previous study, four institutional indicators are included. We estimate four equations. Each estimate takes into account an indicator of institutions and other health determinants. Then, the following model of health will be used in the study:

$$TM_{i,t} = \gamma INS_{i,t} + \beta X_{i,t} + \mu_{i,t} + \varepsilon_{i,t} \quad (1.1)$$

where  $i=1,2,3,..., N$  and  $t=1,2,3,...,T$   $i$  and  $t$  respectively represent countries and years,  $TM$  is a one-dimensional vector that takes into account the average under-5 mortality rate,  $INS$  is the



vector that captures one institution indicator,  $X_{(i,t)}$  the vector of other determinants of health status,  $\mu_{(i,t)}$  the fixed or random specific effect of country  $i$ ,  $\varepsilon_{(i,t)}$  the error term. Specifically, we can write:

$$TM_{i,t} = \theta_1 INS_{i,t} + \beta_1 VA_{i,t} + \beta_2 PE_{i,t} + \beta_3 Ress_{i,t} + \beta_4 SE_{i,t} + \beta_5 POP_{i,t} + \beta_6 Prev_{i,t} + \beta_7 Forest_{i,t} + \varphi (Var\ muettes)_{i,t} + \mu_{i,t} + \varepsilon_{i,t} \quad (1.2)$$

#### 4.2. Data Source and definition of variables

The study uses a panel for 22 countries<sup>3</sup> in SSA with data for the period 2002-2016. The temporal scope of the research is motivated by data constraint availability at the time of the study. The data come from three main sources, notably: *Polity IV* database for the political institution variable (i.e. democracy); 2) World Development Indicators of the World Bank for the dependent variable, stabilization institutions, and control variables (i.e. under-5-mortality rate, size of the State, public expenditures, school enrolment, added value agriculture/GDP, natural resources rents/GDP, rural population, forest area, etc.); and 3) *Economic Freedom Index* (i.e. property rights, regulation). The choice of these datasets was made according to their availability, and the theoretical arguments attest to a relationship between these variables. Besides, these datasets provide indicators of institutions that fit the institutional classification of Rodrik (2000) and North (1991).

The different variables contained in equations (1.2) are:

- *TM* is measured under-5 mortality rate. Indeed, under-5 mortality rate was an indicator of health status (Chambaretaud and Hartmann 2004; Organisation de Coopération et de Développement Economiques 2015). The under-5 mortality rate is the probability that one in every 1000 newborns will die before reaching the age of 5. Information on this indicator is taken from the *World Development Indicators* of the World Bank (2020).
- Institutions were measured by indicators that measures political and economic institutions respectively:
  - democratic institutions (*DEMO*) are measured by the index *Polity 2* of the *Polity IV* dataset of Marshall, Gurr, and Jaggers (2017). This indicator measures the scores on the degree of political pluralism and transparency of electoral processes, the degree of competition in the election of the Chief Executive, and the level of institutional and political constraints on the Chief Executive in the performance of his/her duties. This indicator has values between -10 and +10;
  - property rights (*PRO*) are one economic institution; they are measured by Area 2 of Murphy and Lawson (2018) *Economic Freedom Index*. This indicator measures the degree of respect for the rule of law, the independence of the judiciary, and the protection of private property by the State. This indicator has values between 0 and 10;
  - Regulation (*REG*) are one economic institution; they are measured by Area 5 of Murphy and Lawson (2018) *Economic Freedom Index*. This indicator measures business

<sup>3</sup> Benin, Botswana, Cameroon, Central African Republic, Chad, Congo, the Democratic Republic of the Congo, Ivory Coast, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritius, Namibia, Niger, Nigeria, South Africa, Senegal, Tanzania, Togo, Uganda.

regulation, labor markets regulation, and credit markets regulation. This indicator has values between 0 and 10, and;

- Size of the State (*ST*) as a percentage of the Gross Domestic Product (GDP) is another economic institution (stabilization). The size of the state is general government final consumption expenditure includes all current government expenditure on purchases of goods and services. *World Development Indicators* provide the data.
- The study also takes into account the control variables that influence the health status. The choice of these variables is made according to the availability of data and the theoretical arguments which present a relationship between these variables and health. These variables are taken from *World Development Indicators*:
- agricultural value-added as a percentage of the Gross Domestic Product (VA) which gives the net production of the agricultural sector after having added all the outputs and subtracted all the intermediate inputs; this variable is used because agriculture provides a significant share of jobs (about 48% of the total working population) in African economies (Nouveau Partenariat pour le Développement de l'Afrique 2013);
- Public expenditure (*PE*) is the percentage of public expenditure on health as a percentage of GDP; public expenditure lowers the cost of providing health care (Filmer and Pritchett 1999; Folland, Goodman, and Stano 2013);
- profit from natural resources as a percentage of GDP (*Ress*) which is the sum of oil rents, natural gas rents, coal rents, mineral rents, and forest rents, since minerals represent an average of 70% of total African exports (Centre Africain des Ressources Naturelles 2016);
- School Enrollment, primary (gross) (*SE*) is the ratio of total enrollment, regardless of age, to the population group that officially corresponds to the level of education shown. Education positively affects health (Ross and Wu 1996);
- Rural population (*POP*) as a percentage of the total population (PR) because a good number of public services are more expensive to provide in rural environments which are generally sparsely populated (Lake and Baum 2001),
- Forest area (*Forest*) because malaria is widespread in areas where the forest is widespread. It measures woodlands are natural or planted land with trees at least 5 meters, whether productive or not, and exclude wooded areas from agricultural production systems and trees from urban parks and gardens, and;
- Prevalence of undernourishment (*Prev*) is the percentage of the population whose food intake is insufficient to meet food energy needs continuously.
- Dummy variables are used to improve our estimates. The information necessary for their construction is taken from the *CIA factbook*<sup>4</sup>. It's about:
- religion because it affects health (Oman and Thoresen 2005; Troyer 1988), the variable takes the value 1 if the majority of the population is Christian and 0 otherwise, and;

<sup>4</sup> *CIA Factbook* provides information on history, people and society, government, economy, geography, transport, military matters for 267 entities.

- colonial heritage affects health because beliefs influence the use of health care (McCarthy and Maine 1992; Mulatu and Berry 2001) the variable takes the value 1 if the country is a former British colony and 0 otherwise.

A descriptive analysis of the several institution indicators and health shows that institutions have improved slightly (see Table 1).

**[Table 1: Descriptive statistics institutions and under 5 mortality rate]**

Over the period 2002-2016, these statistics reveal an average democracy quality established at 3.66, on a scale of -10 to 10 with -10 reflecting poor democracy quality and 10 better democracy quality, thus suggesting democracy are average good in SSA. The average of property rights is 4.16 and the average regulation is 6.6 respectively scale of 0 reflecting the bad quality and 10 better quality. Property rights are weak and regulation are relatively good. Besides, the positive correlation between institutions and health seems to be verified. It is noted that the under 5 mortality rate is negatively correlated with the four indicators of institutions. Besides Table 1 illustrates the bivariate correlation of the variables. There is a high significant association between property rights, regulation and under 5 mortality rate with correlation coefficient of -0.65 and -0.58. Democracy and the size of the State are low significant association with under 5 mortality rate, correlation coefficients are respectively -0.4, and -0.44. These results mean institutional variables correlate negatively with under five mortality rate.

#### 4.3. Estimation technique

The econometric specification in this section suffers from the problem of endogeneity related to measurement errors and simultaneity (Greene 2005; Wooldridge 2013). Simultaneity results from the fact that the variable precisely depends on the mortality rate and some explanatory variables such as institutions, public expenditures can be determined at the same time (Acemoglu, Johnson, and Robinson 2001, 2005). Thus, the estimation by the Ordinary Least Square is biased, hence the need to use more efficient methods such as the Two-Stage Least Squares (2SLS) method. 2SLS makes it possible to assign to each variable suspected of suffering from endogeneity biases at least one instrumental variable that may be the lag endogenous variable (Greene, 2005; Wooldridge, 2013).

Instruments should be correlated with endogenous variables and they should orthogonal to any other omitted characteristics, and with the error term. Sargan test was performed to validate instruments. The test of Sargan is not significant. Thus, 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. The estimate is made using Stata 16 software.

## 5. Results and Discussion

The baseline results and the robustness check are presented.

### 5.1. Baseline results

In the baseline model, to investigate the effects of institutions' quality on health in SSA, four equations are estimated. The first equation takes into account, an indicator of democracy quality and control variables (column 1). The second equation takes into account, an indicator



of property rights quality and control variables (column 2). The third equation takes into account, size of the State and other determinants of health (column 3). The fourth equation takes into account, an indicator of regulation quality and control variables (column 4). The results of the estimates are shown in table 2.

The results obtained in table 2 can be interpreted both econometrically and economically. Concerning the econometric design, the test of Sargan is not significant. These results mean instruments are not correlated with the error term meaning that the instruments are valid. Besides, the Kleibergen-Paap RK LM are significant at 1% and 5%. Thus, the null hypothesis that the first stage is under-identified can be rejected, so the instruments are correct.

Economically, the results obtained are heterogeneous. About institutions, it is noted that democratic institutions influence the under-5 mortality rate. Indeed, the coefficient associated with these institutions is negative and significant at 1%. This result means that there is a causal relationship between democratic institutions and the under-5 mortality rate. This can be explained by the fact that in poor countries such as SSA countries, voters are very sensitive to public services such as health care and public health. Integrating public health policies into campaign platforms is a strategy for politicians to win elections. This result is consistent with theoretical expectations, including the predictions of Besley and Kudamatsu (2006), Barnish, Tørnes, and Nelson-Horne (2018), Okada (2018), and McGuire (2020) that show that democratic institutions improve health status.

Regulatory institutions affect health. The coefficient of regulation quality is negative and significant at 10%. Our results mean that there is a causal relationship between regulatory institutions and the under-5 mortality rate too. This relative significance can be explained by the fact that appropriate regulatory mechanisms are difficult to put into practice for developing countries such as Sub-Saharan countries, due to the high costs associated. Indeed, regulatory institutions are involved in solving the problems of information asymmetries in the health sector. Regulatory in Sub-Saharan allows the administration to observe whether the care actually provided by doctors complies with the public health program, as is the case for compulsory infant vaccinations. Our result is consistent with previous empirical studies on the control of corruption on health such as Rajkumar and Swaroop (2008), Dimant and Tosato (2018) as well as Li et al. (2018).

In addition, property rights contribute to improving the health status in SSA. The coefficient associated with property rights is significant and negative at the 1% threshold. Property rights can improve children's health status through the creation and availability of financial resources that can be allocated to health care. It is noted that countries in the sub-Saharan area are adopting laws that allow women to own land. Allendorf (2007) finds that women's ownership of land rights improves the health of children in Nepal. Norton (1998) uses the Human Development Index to conclude that secure property rights improve the well-being of poor people.

[Table 2: Main results of the estimation of the mortality rate by the Two-Stage Least Squares]

However, the size of the state does not affect the health status in SSA. This is illustrated by the insignificant associated coefficient. This situation, which seems to go against intuition, can be explained by the fact that the size of the State in the economy is still below the threshold considered optimal in theoretical work. Karras (1996) finds that the optimal size of the state should be between 18% and 20%, but calculated statistics show that the average size

of the State is 13.57% (see table 1). This result supports the Abuja Declaration's proposal that 15% of total public spending should be allocated to health in Africa (OMS 2014).

The other determinants of health such as education and urbanization have effects that are consistent with the literature's predictions. Education is a source of improved health in SSA. It is noted that the coefficients associated with school enrolment (primary) are significant and negative at 1%. These results are consistent with those of Ross and Wu (1996) or Cutler and Lleras-Muney (2006) who have shown that education positively affects health. Besides, the results show that urbanization plays an important role in health. It is noted that living in a rural environment in the Sub-Saharan zone increases the mortality rate. Indeed, the estimated coefficient is significant and positive at 1%. This result is similar to the work of Eberhardt and Pamuk (2004) and Mansfield et al. (1999), which showed that the prevalence of premature mortality is higher among the rural population.

### 5.2. Robustness check

So far, the regression method suffers from endogeneity problems, such as reverse causality. When health conditions are worse, the poor feel discontent with the quality of institutions (democracy, public expenses, control of corruption). We tackle these problems in the following two ways. First, the same regression is performed with the lagged variables of institutions such as Okada (2018). Columns 1 to 4 of Table 3 reports the estimation results. The results are similar to baseline results. They show that democracy, property rights, and regulation affect the under-5- mortality rate. Indeed, the coefficients associated with the institutions of democracy, property rights, and regulation are negative and significant. Second, an alternative indicator of health status is used follow Dianda and Ouedraogo (2021). We use the maternal mortality rate (per 1000) provided by World Bank (2020). The results are reported in columns 5 to 8 of table 3. The results are similar to those of Table 2 too. The results of the robustness check both show there is no causal relationship between, size of the State and health indicator, but democracy, property rights, and regulatory institutions affect the maternal health indicator. In other words, the maternal mortality (per 1000) reduce with democracy quality, property rights quality, and regulation quality. These results highlight the positive effect of institution quality on health. They also confirm those obtained with the under-5- mortality rate.

### [Table 3: Robustness check]

### Conclusion

Institutions generally have an impact on economic activity, including the improvement of health conditions. Therefore, the objective of this article is to investigate the effects of institutions on health status in SSA over the period 2002 to 2016. Two-Stage Least Squares (2SLS) approach was used to determine and examine which institutions affect health. The findings show that in general institutions have positive effects on health in SSA. Three institutional indicators namely democracy, property rights, and regulation have negative and significant effects on the under-5-mortality rate. Our results offer some policy implications for SSA where institutions' quality and health both remain a challenge. Democracy is found to be important for health, high priority should be given to strengthening political institutions through the application of democratic principles including more decentralization which could provide better information on local information on local health demand and to have rapid and effective responses to local health needs. Besides, the government should include

enforcement of property rights by constitutional protection of the property rights and giving every man or woman the opportunity to enjoy the property, which includes a well-functioning of the legal and judicial system. Including institutional shocks or reforms and the duration of their effects on health may be future avenues of investigation to better understand the contours of the relationship between institutions and health.

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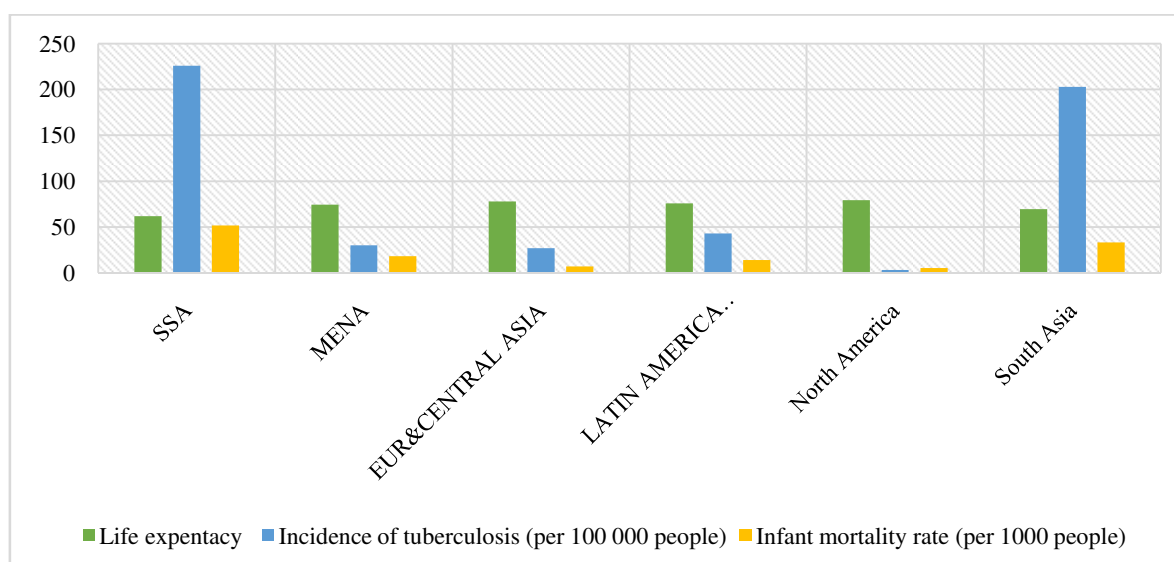


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**Figure 1:** Life expectancy, incidence of tuberculosis and infant mortality rate in the world



Source: Authors calculation, based on data from the World Bank (2020)

**[Table 1:** Descriptive statistics institutions and under 5 mortality rate]

Variables	Observations	Mean	Standard deviation	Minimum	Maximum	Correlation coefficient
Under-5-mortality rate	330	92.71	40.22	14.3	206.1	
Democracy	330	3.66	4.49	-4	10	-0.4**
Property rights	330	4.16	1.5	1.47	7.59	-0.65**
Size of the State	330	13.57	4.47	0.95	26.24	-0.44***
Regulation	330	6.6	0.93	4.36	8.52	-0.58**

Added-agriculture value	330	21.55	1.30	18.69	25.46	0.78**
Gross enrolment	330	102.07	21.78	39.51	149.71	-0.45**
Public expenditures	330	1.81	1.2	0.33	6.76	-0.43**
Prevalence of undernourishment	330	22.76	12.70	4.3	61.8	0.11**
Benefits from natural resources	330	10.88	10.66	0.001	60.12	0.23**
Forest area	330	24.40	18.02	0.89	65.95	-0.08
Rural population	330	62.39	14.69	32.07	85.214	0.29**

*Note* : \*\* Significant at 5%

*Source*: Authors calculation, based on data from the World Bank (2020), Marshall et al. (2017) , Murphy and Lawson (2018)

[Table 2: Main results of the estimation of the mortality rate by the Two-Stage Least Squares]

	(1)	(2)	(3)	(4)
Dependent variable : Under 5 mortality rate				
Added Agricultural Value (% GDP)	0.165 (1.405)	-1.469 (2.541)	0.604 (1.942)	0.590 (2.218)
Benefits of natural resources(% GDP)	0.380** (0.173)	4.805** (2.091)	3.030*** (0.937)	3.659*** (0.953)
School enrolment primary (gross)	-0.791*** (0.0769)	-0.701*** (0.141)	- 0.566*** (0.106)	-0.552*** (0.122)
Rural population (% total population)	0.406*** (0.137)	1.628*** (0.553)	1.225*** (0.257)	1.263*** (0.296)
Forest area	-0.274** (0.108)	-0.169 (0.188)	-0.0880 (0.145)	-0.210 (0.162)
Prevalence of undernourishment	0.102 (0.174)	-0.974 (0.701))	-0.771** (0.323)	-0.816** (0.368)
Public expenditures (%GDP)	-8.702*** (1.811)	1.699 (5.419)	4.101 (2.958)	1.746 (3.348)
Democracy	-2.365*** (0.445)			
Size of the State		0.540 (1.325)		
Property rights			-7.599** (3.084)	
Regulation				-7.232* (4.038)
Dummy variables	yes	yes	yes	yes
Observations	308	330	308	308
Number of country	22	22	22	22
F-Statistic	38.14	12.93	26.35	20.87
Kleibergen-paap rk LM Statistic p-value	0.00	0.03	0.00	0.00
Test de Sargan (P-value)	0.151	0.1921	0.216	0.117
Notes: The values in brackets correspond to the corrected standard deviation of heteroscedasticity. *** $p < 0.01$ significant at 1%, ** $p < 0.05$ significant at 5%, * $p < 0.1$ significant at 10%. The variables in bold are the variables of interest that measure the different institutions.				

Source: Authors calculation, based on data from the World Bank (2020), Marshall et al. (2017), Murphy and Lawson (2018)



**Table 3: Robustness check**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Agricultural Value Added (% GDP)	0.0477 (1.409)	0.0992 (2.503)	0.648 (1.937)	0.583 (2.213)	0.826 (0.871)	1.830** (0.920)	7.168*** (1.402)	5.377*** (0.951)
Benefits of natural resources(% GDP)	0.390** (0.173)	4.720** (2.305)	3.009*** (0.926)	3.634*** (0.949)	0.00513 (0.105)	-0.0883 (0.153)	0.0694 (0.149)	-0.291** (0.119)
School enrolment primary (gross)	-0.793*** (0.0769)	-0.668*** (0.148)	-0.573*** (0.105)	-0.548*** (0.122)	-0.421*** (0.0462)	-0.297*** (0.0616)	-0.147** (0.0668)	-0.0389 (0.0597)
Rural population (% total population)	0.408*** (0.137)	1.523** (0.604)	1.208*** (0.258)	1.245*** (0.298)	0.0248 (0.0847)	-0.100 (0.148)	0.667*** (0.154)	0.0142 (0.0887)
Forest area	-0.272** (0.108)	-0.167 (0.192)	-0.0874 (0.144)	-0.211 (0.161)	-0.0636 (0.0639)	-0.285* (0.161)	0.543*** (0.147)	-0.197*** (0.0696)
Prevalence of undernourishment	0.0874 (0.176)	-0.989 (0.781)	-0.765** (0.322)	-0.797** (0.367)	-0.0938 (0.132)	0.517*** (0.175)	-0.471** (0.193)	0.149 (0.108)
Public expenditures (%GDP)	-8.562*** (1.822)	1.010 (5.459)	4.153 (2.975)	1.636 (3.308)	-3.906*** (1.168)	-13.79* (7.225)	22.24*** (5.404)	-2.072* (1.226)
Democracy	-2.378*** (0.450)				-3.422*** (0.592)			
Size of the State		0.949 (1.632)				0.122 (1.135)		
Property rights			-7.521** (2.997)				-20.51*** (2.943)	
Regulation				-7.164* (4.120)				-22.38*** (2.405)
Dummy variables	yes	yes	yes	yes	yes	yes	yes	yes
Observations	308	308	308	308	330	286	308	308
Number of country	22	22	22	22	22	22	22	22
F-statistic	38.05	12.14	26.31	21.14	35.78	25.85	24.41	36.55
Kleibergen-paap rk LM Statistic p-value	0.00	0.06	0.00	0.00	0.00	0.01	0.00	0.00
Sargan (P-value)	0.139	0.113	0.249	0.111	0.93	0.187	0.226	0.622

Notes: The values in brackets correspond to the corrected standard deviation of heteroscedasticity. \*\*\*  $p < 0.01$  significant at 1%, \*\*  $p < 0.05$  significant at 5%, \*  $p < 0.1$  significant at 10%. The variables in bold are the variables of interest that measure the different institutions.

Source: Authors calculation, based on data from the World Bank (2020), Marshall et al. (2017) , Murphy and Lawson (2018)