Chapter 4
The Impact of Institutions on Economic Growth in Sub-Saharan Africa: Evidence from a Panel Data Approach

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Abstract This study sheds light on the effect of institutional variables on economic growth in sub-Saharan African countries. It empirically analyzes the impact of institutional quality proxied by control for corruption, government effectiveness, and protection of the property right index among others on economic growth in sub-Saharan African countries during the sample period 1996–2012. The sample consisted of 21 sub-Saharan African countries. The methodology is based on first-differenced GMM estimator proposed by Arellano and Bond (Rev Econ Stud 58(2):277–297, 1991) for dynamic panel data, which is robust for taking care of individual fixed effects, heteroskedasticity, and auto-correlation in the presence of endogenous covariates. The results of this study indicate that improving institutional quality, specifically protecting property rights on average had a positive contribution to growth in output per capita in the sampled countries though its effect was small. However, institutional variables such as control for corruption and government effectiveness had a positive effect on growth though they were statistically insignificant. These findings agree with some of the studies conducted so far on the effect of institutions on growth.

Keywords Economic growth · Institutions · Panel data · GMM · Sub-Saharan Africa

4.1 Introduction

After the independence of many African countries in the 1950s and 1960s there was a widely held expectation that poor countries in Africa would 'catch up,' that is, converge in per capita income terms with developed countries. However, this was confirmed to be an unrealistic expectation as more than half a century after independence the continent is still the poorest in the world by any standard where more

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than a quarter of its population is estimated to be food-insecure. Achieving high and persistent economic growth is a prerequisite to decreasing widespread poverty yet for long years after independence most of the African countries have failed to achieve even moderate economic growth rates. It is only in the last eight years or so that African countries have started recording a moderate growth rate. So the puzzle is why unlike other countries in the world, the African continent and other poor countries in the world are still poor whereas some others are at the top of the per capita income ladder?

As there is a dearth and incompleteness of macroeconomic and institutional data for sub-Saharan Africa, it is motivating to investigate the determinants of Africa's poor economic growth record. Since the 1990s, with increasing data availability, cross-country regression analyses have indicated that the 'classical determinants of growth' such as level of technology, international trade, availability of natural resources or population have not fully explained the poor performance of growth in many poor countries. During the last 20 years or so, growth economists have increasingly referred to institutions as answers to the long-standing question concerning what determines economic growth.

There are two rationales for our study. First, studies which assess the effect of institutions on economic growth in developing countries and particularly in sub-Saharan Africa are limited and inadequate even though theoretically the importance of institutions affecting growth is getting more emphasis. A paper worth mentioning here is a study by Naude (2004) in sub-Saharan Africa which investigates the effect of policy, institutions, and geography on economic growth in the continent. It used panel data from 1970 to 1990 using data from 44 African countries. This study, among others, is justified by the fact that it used not one but three major indicators of institutions to achieve its objectives. Second, although few studies have been done so far on the effect of institutions on growth in developing and emerging countries, there is no consensus on which specific indicators of an institution matter the most for growth. Thus, our study also investigated institutions' indicators that are important in affecting growth in the context of Africa.

Based on literature there are two broader classifications of institutions to look to determine how institutions affect growth: an informal one represented by social capital or culture (such as work culture of the society) and formal ones such as laws or regulations. Our paper is based on the formal classification where according to North (1990) institutions are defined as follows:

> the rules of the game in a society, or more formally, the humanly devised constraints that shape human interaction … they structure incentives in human exchange, whether political, social, or economic.

By including proxy variables for institutional quality in traditional growth equations such as the Solow-Swan growth model (the neo-classical growth equation), the effect of institutions can be seen in economic growth.

As far as a proxy for institutional quality is concerned, our paper uses 'protection of property rights,' 'corruption and graft,' and 'government effectiveness.' Thus, our paper tries to investigate the determinants of Africa's poor economic growth

record taking into account the effects of institutions using the Arellano-Bond GMM estimator. The regression is based on data from 21 sub-Saharan Africa countries employing panel data covering the period 1996–2012.

This paper is organized as follows: Section 4.2 provides a brief review of theoretical and empirical literature; Sect. 4.3 deals with descriptive statistics of the growth and institutional patterns in sub-Saharan Africa during the sample period; The empirical methodology is described in Sect. 4.4; and the results are presented in Sect. 4.5; Section 4.6 gives the conclusion.

4.2 Literature Review

4.2.1 Theoretical Review of Institutions Versus Growth

Growth literature uses three major theories to explain the difference in output per capita among nations. First, the neo-classical and endogenous growth theories which have long recognized that differences in output per capita in a society are intimately related to differences in the amount of human capital, physical capital, and technology that workers and firms in that country have access to. For instance, the Solow model emphasizes capital accumulation as a major driver of growth (Solow 1956) while Grossman and Helpman's (1991) theoretical model highlights the quality of capital stock to boost growth. Second, the geographic theory which explains how essential the geographic location of a country is in affecting its growth; this is linked to market access and climatic conditions. Theoretical and empirical research has so far found strong causality between geographic location and the level of income in a country. Third, the last and recent theory, deals with an institutional approach. It emphasizes the importance of institutions in affecting growth.

Institutions are often seen as providing the 'rules of the game' required to set up baseline situations for human interactions which consequently have an impact on social, economic, and political relationships in a society. Institutions include the moral, ethical, and behavioral norms of a society so as such they matter for growth and development (Nelson and Sampat 2001).

To empirically analyze the effect of institutions on economic growth, it is important to identify which types of institutions are more important in affecting economic growth. Different researchers and international organizations including the Heritage Foundation have different classifications of institutions depending on their respective objectives. According to literature, there are at least three types of institutions: political, economic, and financial. The quality of each of these types of institutions is measured through different variables. For example, the main variables of economic institutions are protection of property rights; regulation and the business freedom index; freedom in doing business; financial freedom; investment freedom; and the quality of the regulation system. The main variables for political

institutions are the rule of law that contains the rule of law index, controlling corruption and corruption freedom, and other variables.

Our study used the main economic and political institutional indicators which are expected to have an impact on economic growth in the context of Africa. With this objective, the three indicators used are 'protection of property rights,' 'control of corruption,' and 'government effectiveness.'

When it comes to the extent to which institutional aspects such as property rights, incentive structures, and transaction costs affect economic growth, North (1981) was a pioneer who developed the contract and predatory theory by extending the neo-classical theory to include institutional variables. The contract theory states that if contracts are well enforced, then they contribute beneficially to the efficiency of business and society. If a state provides the legal framework that reduces transaction costs in the presence of some institutions, productivity and innovation increase. On the other side, the predatory theory treats the state as a vehicle for collecting monopolistic rents and transferring the resources among different groups in order to maximize incomes.

4.2.2 Empirical Review of Institutions Versus Growth

How important institutions are in promoting growth in developing and emerging economies has sparked renewed interest in recent years. As a result, a growing literature seeks to determine the extent to which institutions (economic or/and political institutions) affect growth. However, the dearth and limitations of both institutional and macroeconomic data for many developing countries including those in sub-Saharan Africa prevent robust policy interpretations on a country-by-country basis.

A study by Hall and Jones (1999) focused on explaining the enormous differences in per capita incomes among countries. Their empirical findings suggest that differences in capital accumulation, productivity, and ultimately in per capita income are due to differences in institutions and government policies. The authors also argue that controlling for endogeneity of institutions and government policies' long-run economic performance is primarily determined by social infrastructure, which depends on differences in capital accumulation and productivity.

Rodrik et al. (2004) empirically investigated the contribution of institutions, geography, and trade on differences in per capita incomes across countries. Their study found that the effect of institutions was higher compared to the effects of geography and trade in explaining differences in per capita incomes across countries.

Redek and Sušjan (2005) using panel data from 1995 to 2002 based on 24 transition economies in the then eastern socialist economies of Europe examined the effect of institutional quality proxied by private property protection, legal system, regulation, government intervention, and international relations drawn from the Heritage Foundation index. Their study confirmed that the better the protection and regulation of property rights, the lower the fiscal burden and the higher the

growth. That is, as institutional quality increased by 1%, the government's fiscal burden decreased by 0.03%. Similarly, Naude (2004) sheds light on the same objective, but this time using data from 44 African countries and employing both single-year cross-section data and panel data covering the period 1970–90. For comparative purposes, the study used different econometric estimation methods including a dynamic Arellano-Bond GMM estimator. Moreover, the study used three proxies for institutional quality (ethno-linguistic heterogeneity (ELH), corruption and graft and the incidence of revolutions and coups) as proxies. Based on the GMM estimator, the author concluded that none of these had a significant impact on growth but supported Acemoglu et al.'s (2001) 'reversal of fortune' thesis, namely that settler mortality (instrumenting for the quality of institutions) is inversely related to economic growth.

Likewise, a study by Valeriani and Peluso (2011) analyzed the impact of institutions on economic growth and examined whether the eventual impact differed depending on the level of development in a country. They used panel data from 1950 to 2009 for 181 countries (both developing and developed) through a pooled regression model and a fixed effects model. They employed institutional indicators of civil liberties, number of veto players, and quality of government and found that institutional quality impacted economic growth in a positive way. This was true for all three institutional indicators that were examined. The only difference between how developing and developed countries were affected by institutional quality was the size of the impact and not in the direction of it. On a more specific level, out of the three institutional indicators, improved civil liberties had a greater effect on economic growth in developing countries, whereas the number of veto players assumed more importance for developed countries' economies.

With a similar objective, a study by Dushko et al. (2011) used cross-country data from 212 groups of countries and geographic regions and applied different econometric models (OLS, G2SLS, 2SLS). It used the rule of law, revolutions, and Freedom House ratings as well as war casualties as indicators of institutional quality. Their study found that in all the models used, institutional quality had a positive and significant effect in enhancing GDP per capita on average for the sampled countries during the study period.

Acemoglu and Robinson (2010) investigated whether political or economic institutions should be given primacy. Even though their study emphasized that differences in prosperity across countries were due to differences in economic institutions, it also underscored that without building strong political institutions it was not possible to build strong economic institutions which could facilitate growth because economic institutions are the outcome of a political process. Hence, the study deduced that solving the problem of development entailed understanding what instruments can be used to push a society from a bad to a good political equilibrium.

Unlike Acemoglu and Robinson's (2010) study, Glaeser et al.'s (2004) study had the objective of exploring the causal link between institutions and growth. It confirmed that rather than political institutions, human capital had a causal effect on economic growth. Importantly, in that framework, institutions did not directly affect growth.

In general, the empirical literature discussed here indicates positive relationships between the different indicators of institutional quality and cross-country income differences. This means that better institutions foster long-run economic growth, and countries with better institutions have higher per capita income levels. But it is also important to stress that all indicators of institutional variables are not equally important for countries at different levels of development. Moreover, it is also clear from the reviewed literature that there is a dearth of studies on the effect of institutions on growth in general and in sub-Saharan Africa in particular. There is also a lack of consensus on which economic or political indicators of institutions are important in affecting growth and hence per capita income differences among countries.

4.3 Descriptive Statistics of Economic Growth and Institutional Quality in Sub-Saharan Africa

Our sample consists of 21 sub-Saharan African countries. It excludes countries such as Somalia, Eritrea, and others due to missing or incomplete data on one or more of the variables of interest. Mainly data on institutional variables such as protection of property rights, controlling corruption, and government effectiveness were incomplete for a number of countries in the sample region. The sampled countries are Burkina Faso, Botswana, Cameron, Ethiopia, Ghana, Guinea, Kenya, Lesotho, Mozambique, Mauritania, Mauritius, Malawi, Namibia, Niger, Nigeria, Rwanda, Senegal, Chad, Togo, Uganda, and South Africa.

Period average growth in per capita was near 2.6% with substantial differences across countries; this difference was due to internal or external factors (Table 4.1). During 1996–2012 on average, the sampled countries experience a real GDP growth rate of 5.16%, where growth in these countries intensified in the last five years. Table 4.1 also shows that the gross capital formation as a percentage of GDP was around 21%.

Table 4.1 Summary of explanatory variables (1996–2012)

Variable	Mean	Std. dev.	Min.	Max.
GDP (million USD)	2938.85	5010.85	1062.11	307,313
GDP growth rate (%)	5.16	4.14	−9.52	33.74
GDP per capita	1291.57	1757.25	128.24	6683.66
GDP per capita growth rate (%)	2.55	3.95	−12.18	30.344
Gross capital formation as % of GDP	21.14	8.37	5.46	74.82
Government spending % GDP	15.22	6.90	3.86	39.50
FDI_GDP as % of GDP	0.23	0.20	0.004	1.31
Gross enrollment rate/schooling	36.0	25.0	2.22	101.89

Source Author's calculations based on World Bank data

Table 4.2 Descriptive statistics for measures of institutional quality

Variable		Mean	Std. dev	Min	Max
Control of corruption	Overall	38.91	22.34	1.46	85.85
	Between		21.48	10.03	78.48
	Within		7.65	13.98	68.39
Protection of property rights	Overall	40.57	14.91	10	75
	Between		13.09	23.52	70.29
	Within		7.66	19.40	65.2
Government effectiveness	Overall	37.36	20.71	2.42	79.02
	Between		19.78	7.82	72.1
	Within		7.42	15.98	62.9

Source Author's calculations based on World Bank data

Table 4.2 shows that the average measures of institutional quality for the study period were not greater than 40% implying that sub-Saharan African countries had poor quality institutions. One can also see that there was a huge difference between the sampled countries. For example, regarding controlling corruption the minimum figure is 10% while the maximum is around 78% which shows that there was a clear difference among countries in the region concerning controlling corruption; this was also true for the other two variables.

Figure 4.1 shows the index for control of corruption proposed by the World Governance Indicators (WGI) of the World Bank which could serve as a proxy for a country's level of institutional development. It indicates the degree of corruption within a given political system by taking into consideration financial corruption (import and export licenses, exchange controls, tax assessments, or police protection), as well as the following forms of corruption: patronage, nepotism, job reservations, 'favor-for-favors,' and secret party funding. On average, for the

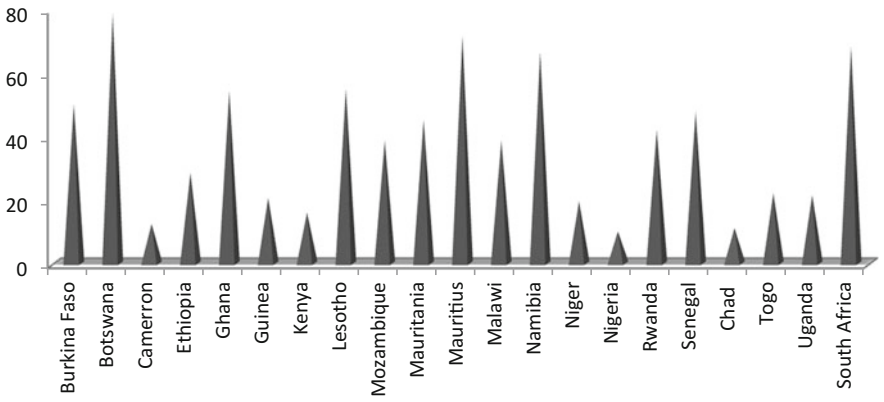

Fig. 4.1 Rank of sub-Saharan African countries by average control of corruption (1996–2012). *Source* Author's calculations based on WGI data, the World Bank

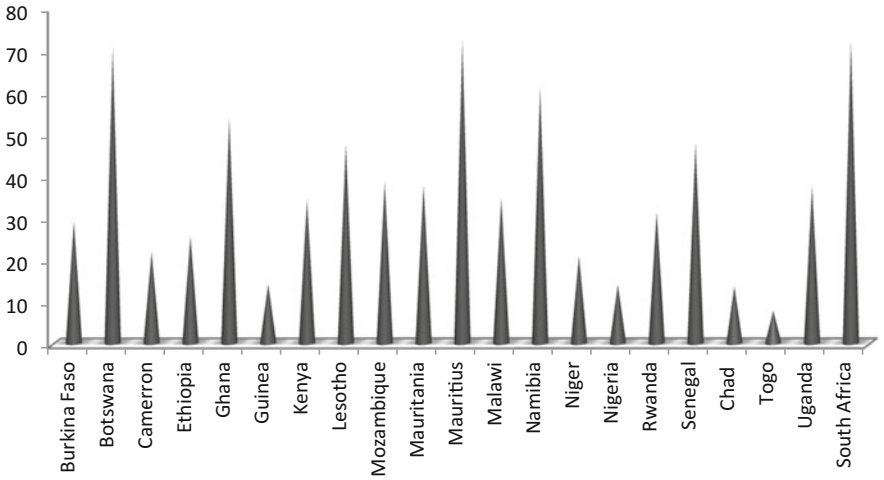

Fig. 4.2 Average rank of Sub-Saharan African countries by government effectiveness (1996–2012). *Source* Author's calculations based on WGI data, the World Bank

sample period, the worse corruption was in Nigeria, Niger, Chad, Cameroon, and Kenya while Botswana, South Africa, Mauritius, and Namibia had relative control over corruption.

Another proxy for institutional development is the quality of government policies which is analyzed through WGI's government effectiveness index. This is a multi-dimensional index which reflects both the quality of public services and of civil services. It accounts for the quality of policies formulated and implemented, for political pressures and also for the government's credibility. The country with the lowest level of government effectiveness was Togo, followed by Chad and Nigeria. South Africa and Botswana registered the highest average on the government effectiveness index during 1996–2012 (Fig. 4.2).

Figure 4.3 shows the average percentage of protection of property rights for the sampled countries in the study period. Botswana and Mauritius were relatively better in the protection of property rights. Rwanda, Chad, and Togo showed poor performance.

4.4 Data and Methodology

Following North (1981) our paper assesses the effect of institutions on economic growth. For this, one can incorporate a proxy for institutions in the neo-classical growth model. To do so we started with the aggregate production function which describes how inputs (labor, physical and human capital, and technology) are combined to produce the output:

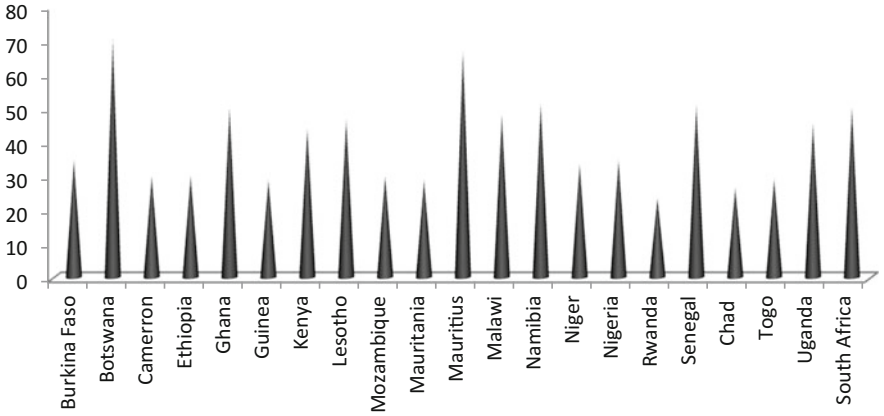

Fig. 4.3 Average rank of protection of property right for sub-Saharan African countries (1996–2012) (%). *Source* Author's calculations based on WGI data, the World Bank

$$Y_{it} = A_t K_t^{\theta} H_t^{\beta} L_t^{1-\theta-\beta} \tag{4.1}$$

where Y is output, H is human capital, L is labor and the parameter A represents the level of technology in the economy, and K is physical capital. Where human capital is the knowledge, skills, and abilities of people who are or who may be involved in the production process while the labor force is the number of people who are able to work. Rewriting Eq. 4.1 in per capita form yields:

$$y_{it} = A_t k_t^{\theta} h_t^{\beta} \tag{4.2}$$

Traditional macroeconomic growth models implicitly assumed an underlying set of good institutions. Hence, they did not take into account the influence of institutional quality as a factor of economic growth. However, the fact that institutions have an important role in the growth process makes economists try to implement institutional quality in growth models. Thus,

$$A_t = A_0 k_t^{\propto_1 (I-I^*)} h_t^{\propto_2 (I-I^*)} \tag{4.3}$$

where A_0 represents the basic level of technology, I^* and I denote the best-quality institutions and the country's current level of institutional quality, respectively. The traditional growth model considers that economies function close to best-quality institutions hence in these models $I = I^*$. This reduces the effect of institutional quality to zero. However, since North (1981) more recent growth theories recognize the importance of institutions. Accordingly, the mathematical statement, $I - I^*$, measures the degree to which a country's institutions fall short of the best conditions.

Therefore, substituting Eq. 4.3 in the equation on the production function per worker, and rewriting it, gives the following:

$$y_{it} = A_0 k_t^{\theta + \propto_1 (I - I^*)} h_t^{\beta + \propto_2 (I - I^*)} \tag{4.4}$$

To study the dynamic of output per capita, taking the log of Eq. 4.4 and a derivative with respect to time (t) and rearranging it gives the following:

$$\frac{\Delta y_t}{y_t} = \frac{\Delta A_0}{A_0} + [(\theta - \propto_1 I^*) + \propto_1 I] \frac{\Delta k_t}{k_t} + [(\beta - \propto_2 I^*) + \propto_2 I] \frac{\Delta h_t}{h_t}$$
$$\text{Let } \pi_0 = \frac{\Delta A_0}{A_0}, \quad \pi_1 = \theta - \propto_1 I^*, \quad \pi_2 = \beta - \propto_2 I^*, \quad \pi_3 = \propto_1 \frac{\Delta k_t}{k_t} + \propto_2 \frac{\Delta h_t}{h_t} \tag{4.5}$$

and adding an error term ε gives growth rate of output per capita as follows:

$$\frac{\Delta y_t}{y_t} = \pi_0 + \pi_1 \frac{\Delta k_t}{k_t} + \pi_2 \frac{\Delta h_t}{h_t} + \pi_3 \Delta I + \varepsilon \tag{4.6}$$

The coefficient estimates for π_1 and π_2 measure the return to physical and human capital investments, while coefficient π_3 measures an increasing return to physical and human capital investments as the country's institutional quality improves. Therefore, Eq. 4.6 is used to test the impact of institutions on growth where π_3 measures the effect of a change in institutional quality on growth through a change in the productivity of both human and physical capital.

To investigate the impact of institutions on economic growth, we used the first-differenced GMM estimator proposed by Arellano and Bond (1991) for dynamic panel data. Thus, Eq. 4.6 can further be rewritten in dynamic panel specification as follows:

$$\ln \text{GDP}_{it} = \mu_0 + \mu_1 \ln \text{GDP}_{i,t-1} + \mu_2 I_{i,t} + \mu_3 \ln X_{i.t} + \eta_i + \varepsilon_{i,t} \tag{4.7}$$

where, $\frac{1}{y_t} = w \ln \text{GDP}_{it}$ represents the natural logarithm of real GDP per capita expressed in constant 2000 US$ for country i at time t and hence $\frac{\Delta y_t}{y_t}$ is the growth rate of GDP per capita as discussed earlier. $\boldsymbol{I}_{i,t}$ stands for the institutional variables for country i at time t (controlling of corruption, government effectiveness, and protection of property rights). $\boldsymbol{X}_{i.t}$ represents both physical and human capital variables as discussed earlier and other macroeconomic control variables. η_i signifies the individual fixed effects specific to each country, and it is constant in time. $\varepsilon_i \sim N(0,\sigma^2)$ is a random disturbance term.

Using the OLS method for estimating, Eq. 4.7 raises several concerns. First, the presence of the lagged dependent variable $\ln \text{GDP}_{i,t-1}$, which is correlated with the fixed effects η_i, gives rise to a dynamic panel bias (Nickell 1981). The coefficient estimate for lagged ln GDP is inflated by attributing a predictive power that actually

belongs to the country's fixed effects. Moreover, it is clear that estimating a panel data model with a lagged dependent variable will lead to biased results at least in small samples with a small time period (Judson and Owen 1999).

Therefore, the alternative solution is to use the generalized method of moments (GMM) developed by Arellano and Bond (1991). It is an efficient estimator for dynamic panels. It is popular in the context of empirical growth research as it allows relaxing some of the OLS assumptions. The Arellano and Bond estimator corrects endogeneity in the lagged dependent variable and provides consistent estimates. Moreover, it allows auto-correlation and heteroskedasticity among others (Roodman 2006).

The first step of the GMM procedure is to differentiate Eq. 4.7 to remove individual effects, that is, η_i which gives the following:

$$\Delta \ln \mathrm{GDP}_{it} = \mu_1 \Delta \ln \mathrm{GDP}_{i,t-1} + \mu_2 \Delta I_{i,t} + \mu_3 \Delta \ln X_{i.t} + \Delta \varepsilon_{i,t} \tag{4.8}$$

In the differenced Eq. 4.8, we still have a correlation between $\Delta\varepsilon_{i,t}$ and $\Delta \ln \mathrm{GDP}_{i,t-1}$, which could be addressed by instrumenting $\Delta \ln \mathrm{GDP}_{i,t-1}$. Finding a valid external instrument is very difficult; hence, GMM draws instruments from within the dataset, that is, lagged values of the dependent and independent variables in case of endogeneity. Thus, the GMM procedure gains efficiency compared to OLS by exploiting additional moment restrictions.

The regression outputs from Eq. 4.7 are short-term estimates in the context of economic growth. Since the effect of different factors should be evaluated in the long run, it is also vital to compute the long-run coefficients. Hence, transforming Eq. 4.7 yields the following:

$$\Delta \ln \mathrm{GDP}_{it} = -\omega(\ln \mathrm{GDP}_{i,t-1} - \rho_2 I_{i,t} + \rho_3 \ln X_{i.t}) + \eta_i + \varepsilon_{i,t} \tag{4.9}$$

where $\omega = (1 - \mu_1)$ and $\rho_j = \left(\frac{\mu_j}{1-\omega}\right), j = 2, 3.$

According to Neuhaus (2006), in Eq. 4.9 the brackets show the long-term relationship among the variables and ρ_j are long-term coefficients of the model. ω is the speed of adjustment to the long-term value and $-\omega$ is the error correction coefficient denoting adjustment of the system of variables to the state of long-run equilibrium (Neuhaus 2006).

As a general estimation strategy, we first estimated a baseline equation containing the lagged GDP levels and the classical growth determinants: gross fixed capital formation (as a percentage of GDP) and trade openness (expressed in terms of exports as a percentage of GDP) which are expected to have a significant positive contribution to growth. In the second model institutional variables (protection of property rights, controlling of corruption and government effectiveness), and gross enrollment as a proxy for human capital, which is expected to have a positive contribution to growth are included. Finally, Model 3 is tested for robustness by introducing one control variable, the general government final consumption expenditure as a percentage of GDP.

Table 4.3 Variables used in the regression analysis

Variable	Description	Source
GDP	Real GDP per capita in constant 2000 US$	The World Bank
GFCF	Gross Fix Capital formation as % in GDP	The World Bank
Trade	Trade openness as % in GDP	The World Bank
Corrupt	Controlling of corruption	WGI
Govef	Government effectiveness	WGI
Pright	Protection of property rights	WGI
Schooling	Gross enrollment rate	World Bank
Gcons	General government final consumption expenditure (% of GDP)	World Bank

First, Eq. 4.8 is estimated using the Arellano-Bond first difference GMM estimator to get the short-run coefficients. Second, the long-run coefficients and the error correction term are computed and tested for its significance using the Wald test. The short-term equations correspond to Model 1 to Model 3 in Table 4.4, while the corresponding long-term equations (Model 1 to Model 3) are given in (Table 4.5).

Finally, to test the consistency of the GMM estimator, checking the validity of the moment conditions is required which can be done using two specification tests: the Hansen test which is a test for over-identifying restrictions and the joint null hypothesis (the instruments are valid) and the Arellano-Bond test for no second-order serial correlation in the error term. To ascertain the consistency of the estimator both the tests are applied.

Table 4.3 represents the various macroeconomic variables and national accounts data. To capture institutional quality, we used some of the vital indicators from the WGI database: controlling of corruption, government effectiveness, and protection of property rights. The dependent variable is represented by real GDP per capita in 21 sub-Saharan African countries. The analyzed period is 1996–2012, covering a series of financial and economic crises.

4.5 Empirical Results

As can be seen from short-run estimates in Table 4.4, Model 1 is the baseline equation where besides the lagged level of GDP, we also introduce classical growth determinants such as gross fixed capital formation and trade openness as a percentage of GDP (export to GDP ratio). Both the lagged levels of GDP and exports to the GDP ratio have the expected signs and are significant while gross fixed capital formation has an unexpected negative sign.

An increase in trade openness (exports as a percentage of GDP) by 1% will raise GDP per capita by 0.093%. The gross fixed capital formation (as a percentage of

Table 4.4 Institutions and economic growth—short-run estimations Dependent variable: Real per capita GDP (logarithm)

Regressors	Model 1	Model 2	Model 3
L.lngdpc	0.156*** (0.059)	0.132** (0.065)	0.106** (0.058)
lnGFCF	−0.067*** (0.018)	−0.07*** (0.018)	−0.063*** (0.023)
lnTrade	0.093** (0.027)	0.107*** (0.027)	0.113*** (0.027)
lnschooling		0.003 (0.016)	−0.003 (0.014)
Government effectiveness		0.001 (0.001)	0.0004 (0.002)
Controlling of corruption		−0.0001 (0.001)	−0.0002 (0.0008)
Property rights		0.003*** (0.001)	0.002*** (0.001)
lnGovernmentConsumption			−0.089** (0.051)
N	315	315	315
No. of instruments	75	79	80
Hansen *j* statistic (*p* value)	0.122	0.476	0.357
Serial correlation test AR2 (*p* value)	0.839	0.901	0.563

Note
Robust standard errors in brackets
*, ** and *** denote significance levels of 10, 5 and 1%
Dependent variable: Real per capita GDP (logarithm)
N represents the number of panel observations
Method used is Arellano and Bond's (1991) first difference GMM
Instruments, Arrelano-Bond type: the dependent variable from lags 2 to 5. Standard instruments: the level of all other regressors
The Hansen test reports the validity of the instrumental variables test. The null hypothesis is that the instruments are not correlated with the residuals (for robust estimations Stata reports the Hansen *j* statistic instead of the Sargan test)
For the Arellano-Bond test, the null hypothesis is that of no serial correlation between residuals

GDP) is negatively related to GDP per capita because of the crowding out effect—in this case, domestic investments are much more important than public investments. On a similar basis, if we look at the long-run estimates (Table 4.5 Model 1) an increase in trade openness by 1% will raise GDP per capita by 0.11%, moreover, a 1% increase in the gross fixed capital formation will reduce GDP per capita by 0.08%. Further, the catch-up term has the expected negative sign, and it is statistically significant.

In Table 4.4, Model 2, the proxy for institutional quality such as the index for controlling of the corruption, the government effectiveness index, and index for protection of property rights have been added to the classical growth determinants to see the effect of institutions on economic growth. The results show that the index

Table 4.5 Institutions and economic growth—long-run estimations Dependent variable: Real per capita GDP (logarithm)

Regressors	Model 1	Model 2	Model 3
L.lngdpc (Convergence.Coefficient)	−0.844*** (0.059)	−0.868*** (0.065)	−0.894*** (0.058)
lnGFCF	−0.079** (0.036)	−0.081** (0.041)	−0.071** (0.034)
lnTrade	0.110** (0.053)	0.123*** (0.027)	0.126*** (0.035)
lnschooling		0.004 (0.02)	−0.003 (0.014)
Government effectiveness		0.002 (0.01)	0.0004 (0.002)
Controlling of corruption		0.002 (0.001)	−0.0002 (0.001)
Property rights		0.004*** (0.001)	0.002*** (0.001)
lnGovernmentConsumption			−0.090** (0.056)

Note
Standard errors in brackets
*, ** and *** denote significance levels of 10, 5 and 1%

for protection of property rights has a positive though the negligible impact on growth in GDP per capita. However, government effectiveness and controlling of corruption indices are not statistically significant although they have the expected sign. Similarly, the gross enrollment rate (schooling) which is a proxy for human capital, even if it is insignificant has the expected positive sign in the presence of institutions. As expected, gross fixed capital formation and trade openness remain highly significant, and the impact of gross fixed capital formation on growth even increases slightly in the presence of institutions.

From Table 4.5, Model 2, the long-term effect of the institutional variable 'protection of property rights' is slightly higher as compared to its short-run estimate, that is, it increases from 0.003 to 0.004% for a 1% increase in the quality of protection of property rights indicating that even in the long run its effects are negligible. Besides, the introduction of institutional variables slightly raises the speed of convergence to the steady state from 0.84 to 0.86.

To test the robustness of the models, we introduced one control variable, the general government final consumption expenditure (as a percentage of GDP) in Model 3 (Tables 4.4 and 4.5). The impact of institutions on growth was still significant to the introduction of the macroeconomic policy variable. The impact of corruption and government effectiveness on economic growth remained insignificant.

Two major concerns in using GMM estimators is how valid the instruments are and controlling the serial correlations of residuals. The p values obtained (see

Table 4.4) using the Hansen test indicate exogeneity of the instruments used, that is, the instrument sets were orthogonal to the regressors and were therefore valid for estimation. Similarly, to tackle the problem of the serial correlation of residuals, we needed to test auto-correlation of second order or more in the errors. Therefore, as can be seen from Table 4.4, the Arellano and Bond test confirmed the null hypothesis of the absence of second-order auto-correlation.

4.6 Conclusion

Understanding the determinants of poor growth performance in poor countries like those in Africa is vital. To understand how important institutions are in determining the growth performance of sub-Saharan Africa countries, this paper empirically analyzed the impact of institutional quality proxied by controlling of corruption, government effectiveness, and the protection of property rights index among others on economic growth in sub-Saharan African countries during the sample period 1996–2012.

The study was based on 21 sub-Saharan African countries. The methodology was based on the first-differenced GMM estimator proposed by Arellano and Bond (1991) for dynamic panel data, which is robust to take into account individual fixed effects, auto-correlation, and heteroskedasticity in the presence of endogenous covariates.

Our study indicates that lagged GDP per capita and trade openness had a significantly positive effect on the growth of real per capita GDP, while gross fixed capital formation and government consumption had negative and significant effects both in the short and long run. While human capital represented by schooling had the expected sign it was not significant. Our study also shows that out of the three institutional variables protection of property rights had a positive and significant effect on growth both in the short and long term, that is, an increase in protection of property rights by 1% increased output per capita by 0.004% at the 99% level of significance in the long term. While institutional variables such as controlling of corruption and government effectiveness had a positive effect on growth, they were statistically insignificant.

Hence, this preliminary study indicates that improving institutional quality in terms of enhancing protection of property rights on average had a positive contribution to growth in output per capita in the sampled countries though its magnitude was very small. This result agrees with some of the studies conducted so far on the effect of institutions on growth. However, it must be considered that all the empirical researches have investigated the relationship between institutions and economic growth but we still face the difficulty of getting good institutional quality indicators which is also true for this study.

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