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Institutions and economic growth in Africa: Evidence from panel estimation

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Abstract:

There is growing emphasis on the role of institutions on explaining Africa's economic growth ahead of the traditional factors such as capital accumulation. However, it is not clear which of the institutions and governance indicators namely control of corruption, government effectiveness, political stability, regulatory quality, rule of law and voice and accountability matter most. This paper empirically examines the impact of institutions on economic growth in Africa. The paper uses a sample of 48 countries for the1996-2016 period. The overall number of observations is 912. The paper applied generalized methods of moment (GMM), fixed effects (FE) and random effects (RE) models. However, due to the fact that GMM is well suited to deal with potential endogeneity problems in the model, inferential statistics of this paper are drawn from GMM regression results. Results of the FE and RE regressions are presented in appendix. Empirical results show that institutions really matter for Africa's economic growth. Among the institutional quality indicators political stability appears to be the most significant factor in explaining real GDP per capita growth in Africa. However, it is worth noting that, the quality of institutions alone may not be sufficient. Along with institutions, the paper reveals that structural factors such as liberalization of trade, fixed capital formation, labour force and foreign direct investment have a significant effect on Africa's economic growth. The implication is that, a policy mix with the aim of improving the quality of institutions as well as reducing trade restrictions, enhancing both domestic and foreign investment and improving the quality of labour force would enhance economic growth in Africa.

JEL Classifications: E02, N17, O43

Keywords: Economic growth, institutions, panel estimation, GMM, Africa

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1. Introduction

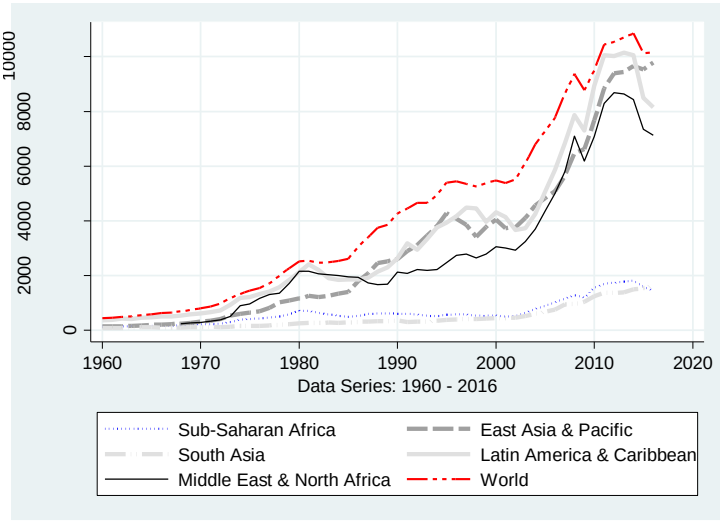
The economic and social situation in Africa has remained fragile and vulnerable to domestic and external shocks (Ulku, 2004). Some African countries emerge from civil wars and armed conflicts that adversely affect economic growth. According to Ulku (2004); Nkurunziza & Bates (2004), armed conflicts coupled with poor weather conditions and deterioration in trade, have led to loss in economic momentum in Africa. For clear understanding that, despite Africa is endowed with natural resources, it is one of the poorest regions in the world; we compare the trends of GDP per capita among the developing regions over the 1960-2016 period. Clearly, as Figure 1 reports, sub Saharan Africa economic growth has been lower than many other developing economies such as East Asia & Pacific and Latin America & Caribbean, especially during the late 1970s, 1980s, 1990s and early 2000s. Low rate of Africa's economic growth apart, data show that real GDP per capita growth in Africa varies greatly across countries, for example over the 1996-2016 period, Equatorial Guinea, on average, grew by 16.9 percent followed by Liberia at 7.1 percent. By contrast, countries such as South Sudan, Libya, and Zimbabwe grew by -7.7 percent, -3.5 percent, and -1.0 percent respectively during the same period. Similarly, countries such as Central African Republic, Burundi, Comoros, Eritrea, Guinea-

Bissau and Gabon, experienced a negative annual average real GDP per capita growth during the 1996-2016 (WDI, 2017).

There is no clear consensus on what is responsible for Africa's poor economic performance although some studies such Sachs & Warner (1997) and Hoeffler (2002) argue that Africa's poor economic performance can be explained by the same variables that account for the growth performance in other developing countries and that to promote growth in Africa, attention should be given to the basic factors such as investment in physical capital, human capital, population growth and access to modern technologies. Other studies, point out that accumulation of these factors is likely to be affected by institutional characteristics such as the distribution of political and civil rights, the quality of the legal system and government effectiveness. Notably, traditional growth models including Koopmans (1965), Cass (1965) and Solow (1956) explain the differences in per capita income in terms of factor accumulation. Similarly, Lucas (1988) and Romer (1986) emphasize that externalities from physical and human capital accumulation could persuade sustained steady economic growth. However, North & Thomas (1973) argue that although innovations and factor accumulation may enhance economic growth, the fundamental explanation of country's comparative economic growth is the differences in institutions. In fact, quality of institutions such as political stability, control of corruption, and regulatory quality and rule of law can significantly influence investments in physical and human capital, technology, and industrial production which in turn lead to economic growth. Nonetheless, the policy and institutional assessment ratings in SSA have been around 3 out 6. Very few countries namely, Cabo Verde, Ghana, Benin, Lesotho, Burkina Faso, Mali, Senegal and Tanzania had their CPIA transparency, accountability, and corruption in the public sector ratings above 3 (WDI, 2017). By and large, the implication here is that the quality of SSA institutions is low. Thus, African economic growth calls for researchers and economists to analyse its nature.

The main objective of this paper is to examine the impact of institutional factors namely control of corruption, government effectiveness, political stability, regulatory quality, rule of law and voice and accountability on and economic growth in Africa. The study also considers structural factors such as trade liberalization, gross fixed capital formation, exchange rate, inflation rate, foreign direct investments, and population growth rate as a proxy for labour force as control variables. The rate of growth of GDP per capita growth is used in this paper as good measure of economic growth.

FIGURE 1. GDP PER CAPITA GROWTH BY REGIONS
current US$, 1960-2016



Source: Authors estimates using World Development Indicators, 2017.

2. Literature review

Traditional growth theories highlight the importance of human capital, technological diffusion, and public infrastructure or incentives to innovate in explaining the cross-country differences in growth (see for example Lucas (1988); Barro & Sala-i-Martin (1997); Barro (1990) and Romer (1990)). However, in recent years, there is growing emphasis on the role of institutions and governance on economic growth. For example, Acemoglu et al. (2005) and IMF (2005), argue that institutions are more fundamental causes of economic growth. Similarly, North & Thomas (1973) argue that institutions are the sources of differences in economic growth across countries. According to Acemoglu et al. (2005), institutions play key role in development by influencing investments and production organization.

Rodrik (2000) emphasizes that institutions not only exert direct influence on economic growth but also affect other determinants of growth such as the physical and human capital, investment, technical changes which in turn lead to an increase in the growth of an economy. To shed light on the importance of institutions on economic growth, the empirical studies by Giavazzi & Tabellini (2005); Roll & Talbott (2002) and Persson (2005), by and large, suggest a positive correlation between democracy and economic growth. Similary, Tavares & Wacziarg (2001) find that democracy in terms of credibility and political stability can foster growth by raising educational attainments and enhances growth by affecting the rate of physical capital accumulation. This implies that economic growth tends to be lower in countries where political instability is greater.

In a similar analysis, Mauro (1995) reveals that corruption has a significant negative direct effect on investment and growth. He also shows that efficient bureaucracies and rule of law positively influence growth. In fact, Hall & Jones (1999) show that institutions are the primary cause in the variations of capital accumulation, productivity and therefore output per worker. Moreover, Sokoloff & Stanley (2000) provide empirical evidences that suggest that institutions have a positive impact on economic growth in Asian countries which implies that institutions are growth enhancing.

Despite the importance of institutions in explaining economic growth, it is worth noting that the institutional view of growth is inconclusive and still inviting a debate with both the traditional and endowment views of growth. Understandably, the endowment view claims that natural resources determine the productivity and technology in production. However, some studies, for example McGuire & Olson (1996) point out that most economic activities are separated from raw materials and arable land and, therefore, natural resources do not account for diverse cross-country economic performances over time. According to McGuire & Olson (1996), political and economic institutions are the main determinants of economic performance. Nevertheless, Kormendi & Meguire (1985), while estimating the correlation between institutions and growth for 47 countries over the 1950-1977 period, reveal that there is no significant relationship between them. Similarly, the study by Grier & Tullock (1989) for a sample of 89 developing countries shows that there is no significant effect of institutions on economic growth. Also, Barro & Lee (1993) reveal a statistically insignificant relationship between democracy and growth.

In general, few studies have empirically examined the growth effects of institutions on economic growth. In addition, these studies have shown that the impact of institutions on economic growth is different across regions and countries. This also implies the role of institutions in African economic growth is inclusive. This paper adds to this debate by empirically investigating the impact of the quality of institutions on economic growth in Africa while taking into account the influence of the traditional or basic variables. In this paper, six indices of governance have been provided to capture various dimensions of institutional quality. The indices include control of corruption, government effectiveness, political stability, and regulatory quality, rules of law and voice and accountability.

3. Data, variables and sample size

This paper covers 48 African countries. Countries were selected basing on the availability of data for all the variables included in the estimation models. Data on each variable were collected over the 1996-2016 period. As a result total number of observations is 912. Table 1 reports a list of countries that were included in the empirical analysis of this paper. The Table also shows the nature of a particular country in terms of natural resources, income group, geographical location and region. Few countries namely, Djibouti, Eritrea, Sao Tome & Principe, Somalia, South Sudan, and Zimbabwe were excluded in the empirical analysis due to missing one or more observations. The paper used a balanced paned data. However, some countries may have been included in some descriptive analysis because such analysis does not necessarily require all observations. The data were sourced mainly from World Bank Word Development Indicators (WDI) (2017) and Worldwide Governance Indicator (WGI) (2017). Definitions and measurements of the variables are as presented in Table 2.

To determine the direction and degree of association-ship among the variables, we present the correlation matrix in Table 3. The sign and the magnitude of the correlation coefficients give rough idea of kind of relationship that exist between measures of institutions and economic growth on one hand, and the institutional indices themselves on the other hand. Similarly, Table 4 provides a general picture of the correlation between basic variables and economic growth. Clearly, all the indicators of institutions have positive correlation coefficients indicating positive correlation between quality of institutions and rate of GDP per capita growth. However, the values of the correlation coefficients are relatively low indicating weak correlations between institutional indices and economic growth. Notably, the correlation among the institutional indices is high suggesting that, for robust estimates, the indices should be estimated separately. All the correlation coefficients of the basic or structural variables, except exchange rate, are positive.

TABLE 1. SAMPLE COUNTRIES USED IN THE EMPIRICAL ANALYSIS

	Country	Natural resources	Income group	Region	Geo-Access
1	Algeria	Resource rich	Upper middle income	North Africa	Coastal country
2	Angola	Resource rich	Upper middle income	Southern Africa	Coastal country
3	Benin	Not resource rich	Low income	West Africa	Coastal country
4	Botswana	Resource rich	Upper middle income	Southern Africa	Landlocked country
5	Burkina Faso	Not resource rich	Low income	West Africa	Landlocked country
6	Burundi	Not resource rich	Low income	East Africa	Landlocked country
7	Cabo Verde	Not resource rich	Lower middle income	West Africa	Coastal country
8	Cameroon	Resource rich	Lower middle income	Central Africa	Coastal country
9	CAR	Not resource rich	Low income	Central Africa	Landlocked country
10	Chad	Resource rich	Low income	Central Africa	Landlocked country
11	Comoros	Not resource rich	Low income	East Africa	Coastal country
12	Congo	Resource rich	Lower middle income	Central Africa	Coastal country
13	Congo, D.R.	Resource rich	Low income	Central Africa	Coastal country
14	Côte d'Ivoire	Resource rich	Lower middle income	West Africa	Coastal country
15	Egypt	Resource rich	Lower middle income	North Africa	Coastal country
16	E. Guinea	Resource rich	High income	Central Africa	Coastal country
17	Ethiopia	Not resource rich	Low income	East Africa	Landlocked country
18	Gabon	Resource rich	Upper middle income	Central Africa	Coastal country
19	Gambia	Not resource rich	Low income	West Africa	Coastal country
20	Ghana	Resource rich	Lower middle income	West Africa	Coastal country
21	Guinea	Resource rich	Low income	West Africa	Coastal country
22	G.Bissau	Not resource rich	Low income	West Africa	Coastal country
23	Kenya	Not resource rich	Lower middle income	East Africa	Coastal country
24	Lesotho	Not resource rich	Lower middle income	Southern Africa	Landlocked country
25	Liberia	Resource rich	Low income	West Africa	Coastal country

TABLE 1. SAMPLE COUNTRIES USED IN THE EMPIRICAL ANALYSIS

	Country	Natural resources	Income group	Region	Geo-Access
26	Libya	Resource rich	Upper middle income	North Africa	Coastal country
27	Madagascar	Not resource rich	Low income	Southern Africa	Coastal country
28	Malawi	Not resource rich	Low income	Southern Africa	Landlocked country
29	Mali	Not resource rich	Low income	West Africa	Landlocked country
30	Mauritania	Resource rich	Lower middle income	North Africa	Coastal country
31	Mauritius	Not resource rich	Upper middle income	Southern Africa	Coastal country
32	Morocco	Not resource rich	Lower middle income	North Africa	Coastal country
33	Mozambique	Not resource rich	Low income	Southern Africa	Coastal country
34	Namibia	Resource rich	Upper middle income	Southern Africa	Coastal country
35	Niger	Not resource rich	Low income	West Africa	Landlocked country
36	Nigeria	Resource rich	Lower middle income	West Africa	Coastal country
37	Rwanda	Not resource rich	Low income	East Africa	Landlocked country
38	Senegal	Not resource rich	Lower middle income	West Africa	Coastal country
39	Seychelles	Not resource rich	High income	East Africa	Coastal country
40	Sierra Leone	Resource rich	Low income	West Africa	Coastal country
41	South Africa	Resource rich	Upper middle income	Southern Africa	Coastal country
42	Sudan	Resource rich	Lower middle income	East Africa	Coastal country
43	Swaziland	Not resource rich	Lower middle income	Southern Africa	Landlocked country
44	Tanzania	Not resource rich	Low income	East Africa	Coastal country
45	Togo	Not resource rich	Low income	West Africa	Coastal country
46	Tunisia	Not resource rich	Upper middle income	North Africa	Coastal country
47	Uganda	Not resource rich	Low income	East Africa	Landlocked country
48	Zambia	Resource rich	Lower middle income	Southern Africa	Landlocked country

Source: Authors construction with the help of African Economic Outlook, 2017.

TABLE 2. DEFINITIONS OF VARIABLES AND SOURCE OF DATA

Variable	Abbrev.	Definition	Source
GDP growth	*Y*	GDP per capita, annual growth	WDI, 2017
Gross fixed capital formation	*GFCF*	Gross fixed capital formation, percent of GDP	WDI, 2017
Degree of openness	*Trade*	Sum of exports and imports of goods and services, percent of GDP	WDI, 2017
Inflation	π	Consumer prices, annual percent	WDI, 2017
Population growth	*P*	Population, annual growth,	WDI, 2017
Exchange rate	*EX*	Local currency/US$	WDI, 2017
Foreign direct investment	*FDI*	FDI to GDP ratio	WDI, 2017
Control of corruption	*CC*	Perceptions of the extent to which public power is exercised for private gain, including petty and grand forms of corruption. (-2.5:2.5 scale)	Worldwide Governance Indicators, 2017
Government effectiveness	*GE*	Perceptions of the quality of public services, civil service and the degree of its independence from political pressures (-2.5:2.5 scale)	Worldwide Governance Indicators, 2017
Political stability &	*PS*	Perceptions of the likelihood of political	Worldwide

TABLE 2. DEFINITIONS OF VARIABLES AND SOURCE OF DATA

Variable	Abbrev.	Definition	Source
absence of violence /terrorism		instability and/or politically-motivated violence, including terrorism (-2.5:2.5 scale)	Governance Indicators, 2017
Regulatory quality	*RQ*	Perceptions of the ability of the government to formulate & implement sound policies and regulations that permit and promote private sector development (-2.5:2.5 scale)	Worldwide Governance Indicators, 2017
Rule of law	*RL*	Extent to which agents have confidence in and abide by the rules of society (-2.5:2.5 scale)	Worldwide Governance Indicator, 2017
Voice and accountability	*VA*	Perception of the extent to which citizens are able to participate in selecting their government, freedom of expression, association, and a free media (-2.5:2.5 scale)	Worldwide Governance Indicators,2017

Source: Authors' construction.

TABLE 3. CORRELATION MATRIX OF THE VARIABLES, 1996 - 2016

	GDP	Trade	π	POP	GFCF	EX	FDI	CC	GE	PS	RQ	RL	VA
GDP	1												
Trade	0.281	1											
π	0.004	0.046	1										
POP	0.143	-0.106	0.021	1									
GFCF	0.384	0.649	0.008	0.086	1								
EX	-0.040	-0.131	-0.026	0.173	-0.072	1							
FDI	0.238	0.504	0.000	0.146	0.501	0.006	1						
CC	0.002	0.122	-0.076	-0.464	0.086	-0.223	-0.060	1					
GE	0.022	0.080	-0.045	-0.436	0.111	-0.247	-0.085	0.856	1				
PS	0.047	0.284	-0.111	-0.217	0.190	-0.152	0.029	0.656	0.628	1			
RQ	0.017	0.047	-0.099	-0.311	0.030	-0.138	-0.141	0.768	0.861	0.599	1		
RL	0.011	0.124	-0.092	-0.424	0.144	-0.233	-0.065	0.862	0.888	0.758	0.832	1	
VA	0.001	0.066	-0.080	-0.275	0.051	-0.096	-0.025	0.722	0.700	0.634	0.696	0.763	1

Source: Authors' estimates.

5. Empirical analysis

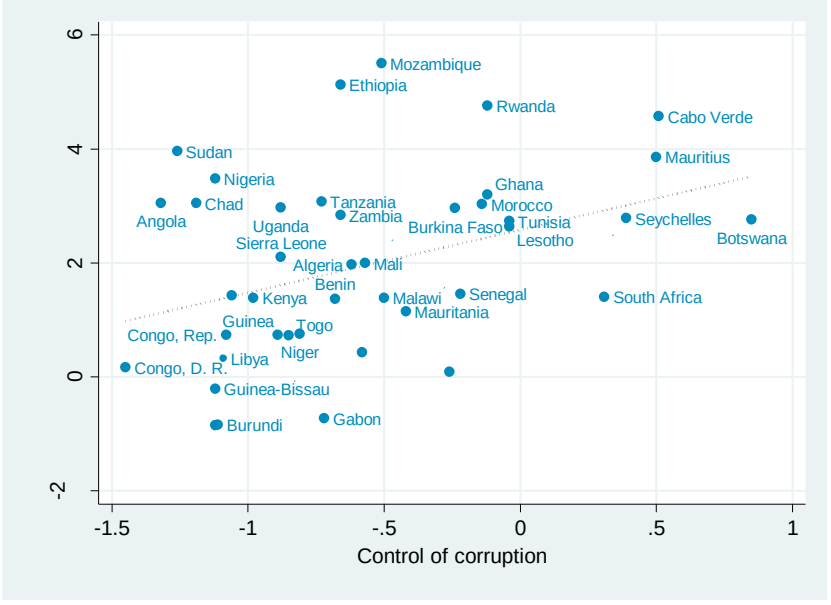
5.1. Graphical analysis

How responsive GDP per capita is to the quality of institutions is a central question in economic growth analysis in Africa. However, before turning to the baseline regression results, we show the observed relationship in Africa between GDP per capita growth and the quality of institutions on one hand, and structural variables on the other hand using

scatter diagrams. Figures 2-11 report the observed correlations between real per capita growth and independent variables in different African countries. The observed positive relationship between growth of GDP per capita and the quality of institutions namely control of corruption, government effectiveness, political stability, and regulatory quality, rule of law and voice and accountability in Figures 2-7 is in line with most of the findings in the literature. Generally, data show that countries with the best quality of institutions for example Mauritius, Botswana, Ghana, Seychelles, Mozambique and Cabo Verde have higher rate of GDP per capita growth than countries with poor institutions quality. For example African countries such as Democratic Republic of Congo, Congo Republic, Burundi, Libya, and Guinea Bissau are among the politically unstable and highly corrupt countries in Africa and consequently seem to have very low rates of economic growth.

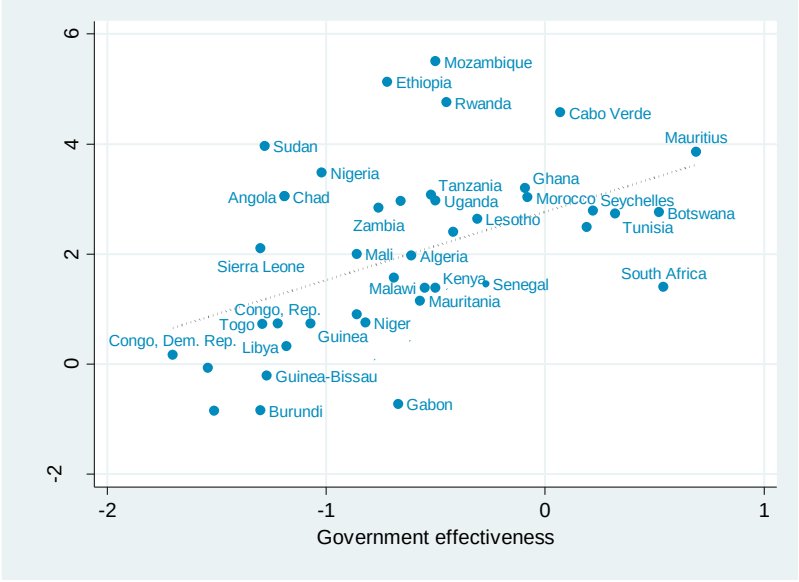
The implication here is that there are tremendous cross-country differences in the quality of institutions and governance in Africa. As a result, the rate of growth of GDP per capita is widely spread across African countries. Undoubtedly, investors tend to drive away from a politically unstable, bureaucratic, and highly corrupt economies with inefficient and nontransparent government services. By contrast, a less corrupt and politically stable economy and socially accountable government tends to have an inclusive growth. Nevertheless, correlation may not determine that the countries with worse institutions are poor because of their institutions. In fact, economic growth is a function of many variables including structural factors. These factors are reported in Figures 8-13. An important observation is that African countries that have higher degree of trade openness, foreign direct investment and gross fixed capita formation seem also to have higher rate of economic growth. However, as states above, evidence based on correlation does not establish whether trade, FDI and GFCF are important determinants of economic outcomes in Africa.

FIGURE 2. GDP PER CAPITA GROWTH VS. CONTROL OF CORRUPTION, 1996-2016



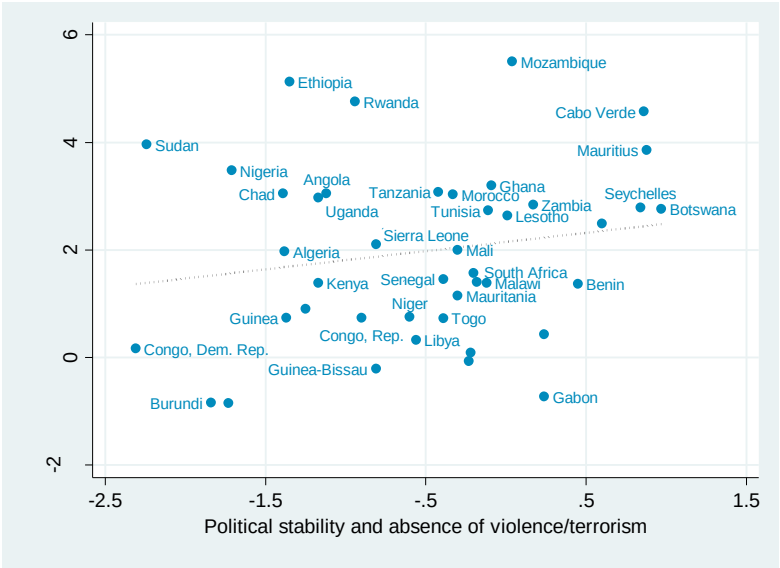
Source: Authors' estimates.

FIGURE 3. GDP PER CAPITA GROWTH VS. GOVERNMENT EFFECTIVENESS, 1996-2016



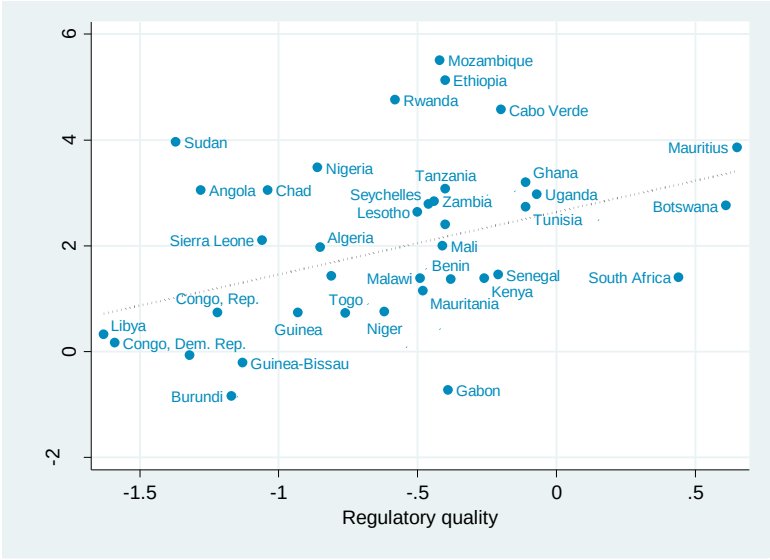
Source: Authors' estimates.

FIGURE 4. GDP PER CAPITA GROWTH VS. POLITICAL STABILITY, 1996-2016



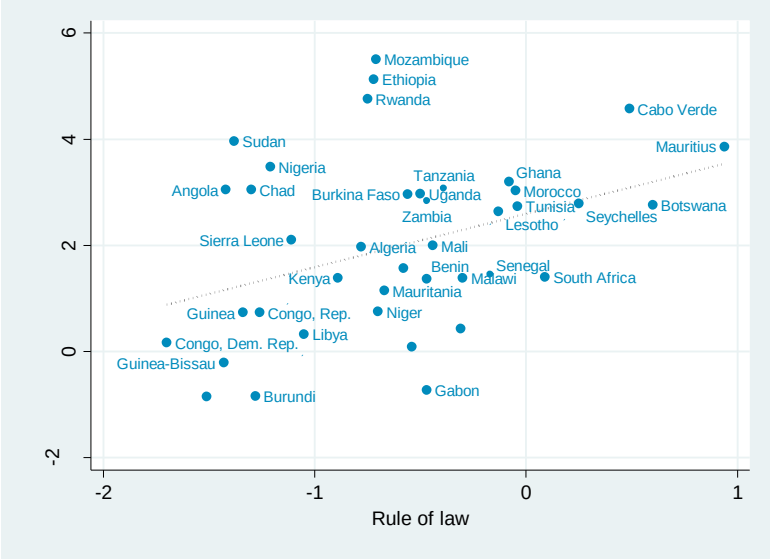
Source: Authors' estimates.

FIGURE 5. GDP PER CAPITA GROWTH VS. REGULATORY QUALITY, 1996-2016



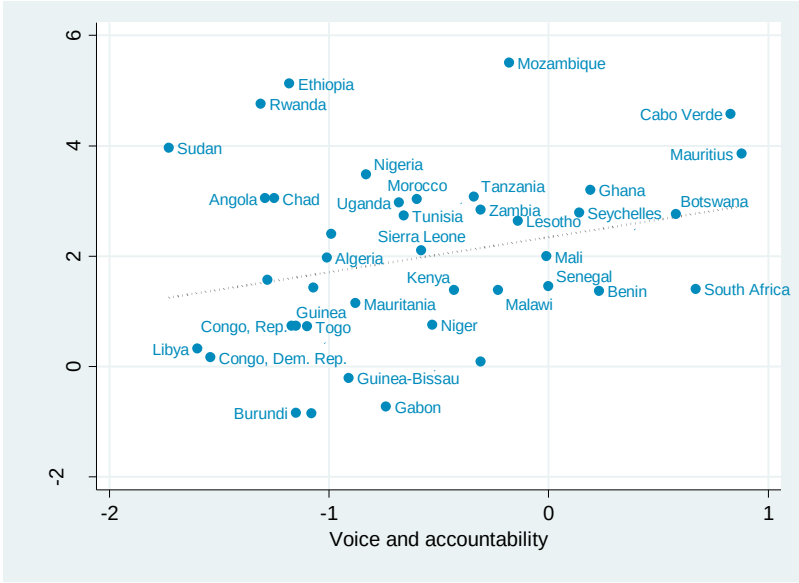
Source: Authors' estimates.

FIGURE 6. GDP PER CAPITA GROWTH VS. RULE OF LAW, 1996-2016



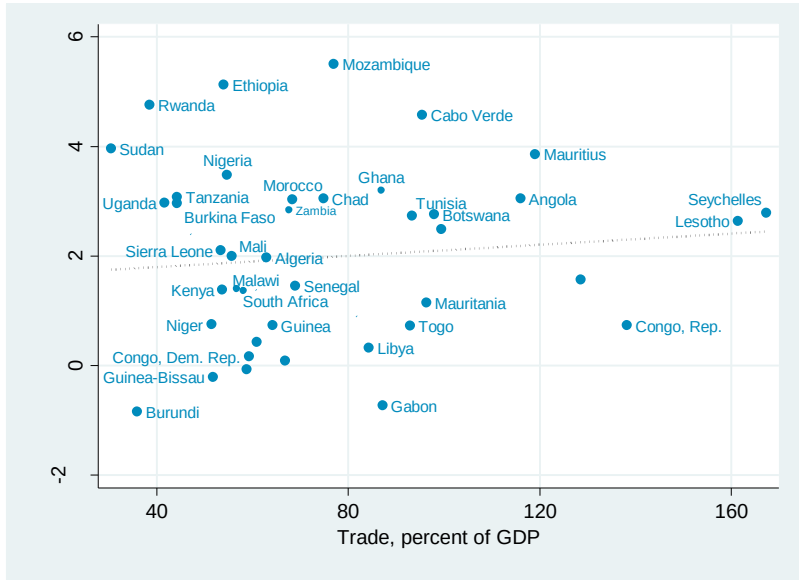
Source: Authors' estimates.

FIGURE 7. GDP PER CAPITA GROWTH VS. VOICE AND ACCOUNTABILITY, 1996-2016



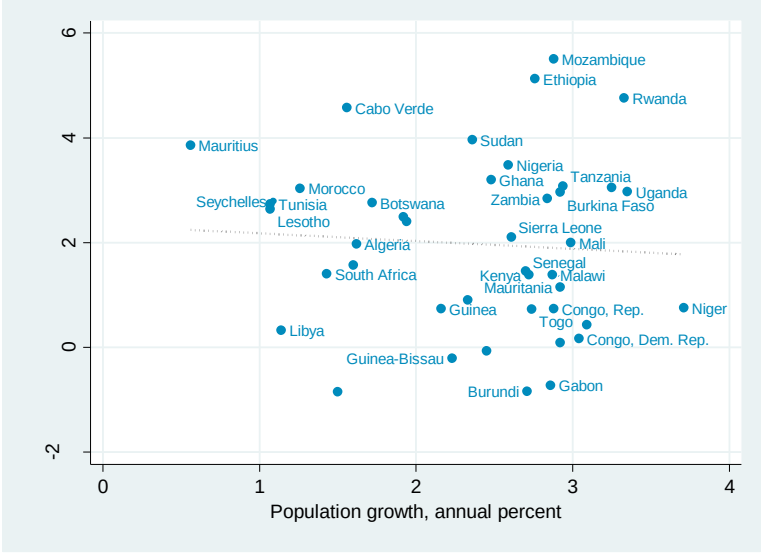
Source: Authors' estimates.

FIGURE 8. GDP PER CAPITA GROWTH VS. TRADE, 1996 - 2016



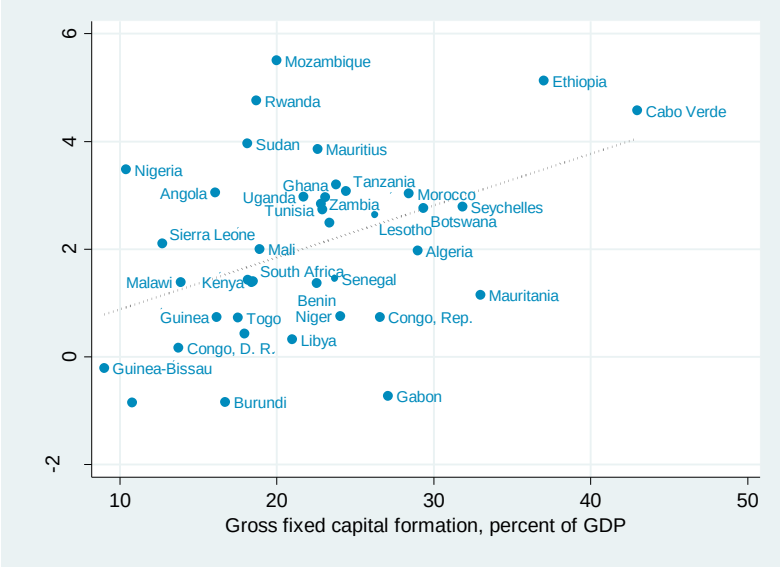
Source: Authors' estimates.

FIGURE 9. GDP PER CAPITA GROWTH VS. POPULATION GROWTH, 1996-2016



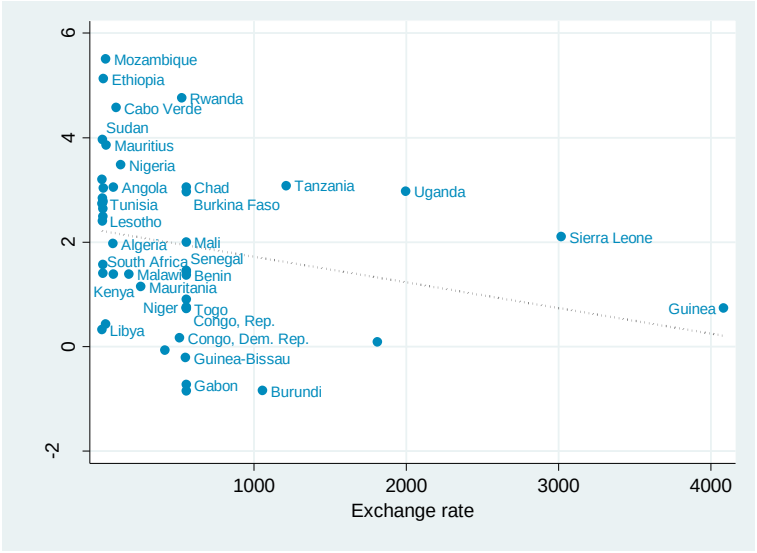
Source: Authors' estimates.

FIGURE 10. GDP PER CAPITA GROWTH VS. GROSS FIXED CAPITAL FORMATION 1996-2016



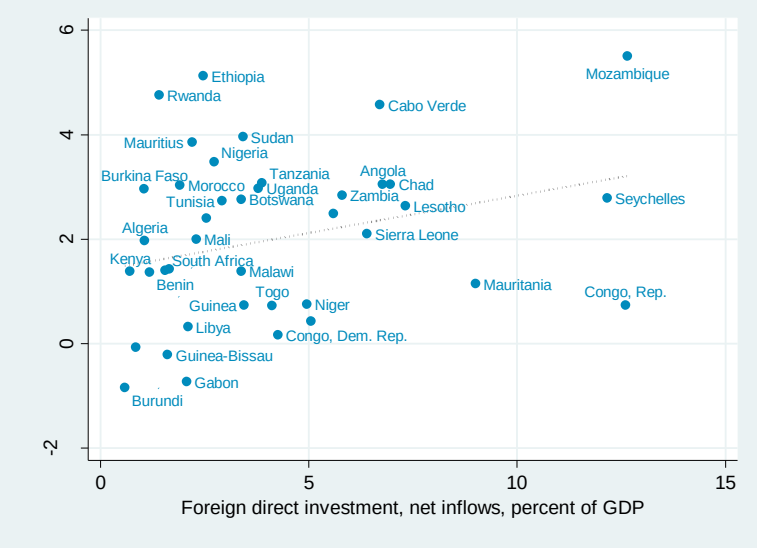
Source: Authors' estimates.

FIGURE 11. GDP PER CAPITA GROWTH VS. EXCHANGE RATE IN AFRICA, 1996-2016



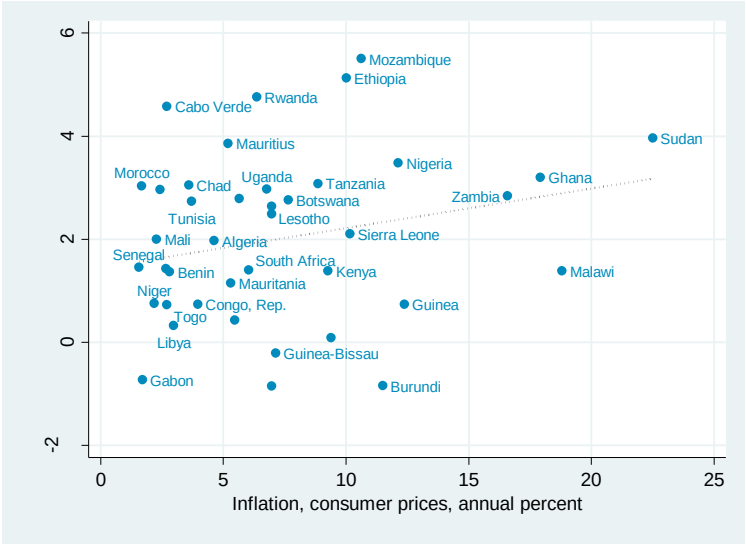
Source: Authors' estimates.

FIGURE 12. GDP PER CAPITA GROWTH VS. FOREIGN DIRECT INVESTMENT 1996-2016



Source: Authors' estimates.

FIGURE 13. GDP PER CAPITA GROWTH VS. INFLATION RATE, 1996-2016



Source: Authors' estimates.

5.2. Baseline regression analysis

The choice of appropriate estimation method is paramount for realizing robust estimates. To examine the effect of institutions on economic growth in Africa, this paper employs panel data estimation techniques. The panel data estimation techniques are considered as efficient analytical methods, since they allow combining different cross sections and time periods, and provide more reliable, valid and robust inferences. Specifically, the paper employs generalized method of moment estimators for panel models, fixed effects and random effects models.

The generalized method of moments (GMM) estimators was developed for dynamic models of panel data introduced by Holtz-Eakin et al. (1990), Arellano & Bond (1991) and Arellano & Bover (1995). The GMM estimator is an extension of Instrumental Variable (IV) methodology. Consider the following regression equation:

$$Y_{it} - Y_{it-1} = (\alpha - 1)Y_{it-1} + \beta.X_{it} + \gamma.W_{it} + u_i + \varepsilon_{i,t} \quad (1)$$

where Y_{it} is the real GDP per capita, $\Delta Y_{it} = Y_{it} - Y_{it-1}$ is the rate of GDP per capita growth, Y_{it-1} is the initial level of GDP per capita, X_{it} represents a vector of structural explanatory variables while W_{it} represents a vector of governance and institutional variables. u_i is an unobserved country-specific effect, ε_{it} is the error term. α , β and γ

are unknown parameters to be estimated. Moreover, the subscripts i and t represent country and time period respectively. Equation (1) can be expressed in the following form

$$Y_{it} = \alpha Y_{it-1} + \beta.X_{it} + \gamma.W_{it} + u_i + \varepsilon_{i,t} \tag{2}$$

To eliminate country-specific effects, we take first differences of (2) as follows:

$$Y_{it} - Y_{it-1} = \alpha\left(Y_{it-1} - Y_{it-2}\right) + \beta\left(X_{it} - X_{it-1}\right) + \gamma\left(W_{it} - W_{it-1}\right) + \varepsilon_{it} - \varepsilon_{it-1} \tag{3}$$

The construction of the new error term, $\varepsilon_{it} - \varepsilon_{it-1}$ with the lagged dependent variable, $Y_{it-1} - Y_{it-2}$ corrects the likely endogeneity of the variables (see also Levine et al., 2000; Alimi, 2015). The GMM panel estimator uses the following moment conditions:

$$\begin{aligned} E\left[Y_{it} - s\left(\varepsilon_{it} - \varepsilon_{it-1}\right)\right] &= 0 \; for s \geq 2; t = 3,\ldots,T \\ E\left[X_{it} - s\left(\varepsilon_{it} - \varepsilon_{it-1}\right)\right] &= 0 \; for s \geq 2; t = 3,\ldots,T \\ E\left[W_{it} - s\left(\varepsilon_{it} - \varepsilon_{it-1}\right)\right] &= 0 \; for s \geq 2; t = 3,\ldots,T \end{aligned} \tag{4}$$

under the assumptions that the error term, ε, is not serially correlated and that the regressors, X, W, are weakly exogenous. Intuitively, the GMM takes into consideration the time series dimension of the data, and nonobservable country specific effects. It also take into account the inclusion of lagged dependent variables among the explanatory variables and the possibility that all explanatory variables are endogenous (Bond et al., 2001; Caselli et al., 1996). However, statistical shortcomings with this estimator as reported by Alonso-Borrego & Arellano (1996) and Blundell & Bond (1998), is that when the regressors are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences.

In the baseline panel regressions, the paper also uses fixed and random effects specifications. Fixed effect assumes that the individual specific effect is correlated to the independent variable while random effect assumes the individual specific effects are uncorrelated with the independent variables. The fixed specification is as follows

$$Y_{it} = \alpha_i + \beta X_{it} + \lambda W_{it} + \varepsilon_{it} \tag{5}$$

Where α_i is the country fixed effect and ε_{it} is the usual random disturbance term. The other variables are as defined above. As an alternative, the random effect specification is expressed as

$$Y_{it} = \alpha + \beta X_{it} + \gamma W_{it} + \eta_i + \varepsilon_{it} \quad (6)$$

where η_i is the random effect or the unobserved country-specific effects. *t-test* is used to test the significance of the coefficient of each variable included in the model, while the *F-test* is applied to test whether the coefficients are jointly or simultaneously equal to or different from zero.

Because of the high degree of collinearity between the institutional variables, we use those variables in separate specifications. Table 4 reports the GMM regressions of GDP per capita growth on institutional variables and structural variables. Here, we present the regressions results of the dynamic panel data model (GMM), while both fixed effects and random effects regressions results are reported in Appendix (Tables 1a and 1b). GMM is well suited to deal with endogeneity problem. Thus, because of potential endogeneity problem in our model, GMM provides good results and accordingly, the results are discussed in this paper.

GMM regression results show that the coefficients on control of corruption (*CC*), government effectiveness (*GE*), political stability and absence violence/terrorism (*PS*), regulatory quality (RQ), rule of law (*RL*), and voice and accountability (*VA*) in models 1-6, respectively, are positive and statistically significant, suggesting that the rate of growth of GDP per capita is higher in better institutions and governance economies. Among these different institutions and governance indicators, political stability and absences of violence seem to have the most influence on economic growth. Overall, results suggest that that improved institutions would increase the rate of growth in Africa. These results are in conformity with our expectations that good governance, politically stable and less corrupt economies are likely to grow faster.

The most significant variables however, are degree of openness, gross fixed capital formation and population growth rate. Similarly, foreign direct investment seems to have a great effect on economic growth in Africa. The coefficients on these four variables are positive and statistically significant at 1 percent level. In fact, degree of openness and gross fixed capital formation are statistically significant in all models. These results suggest that African countries that have liberalized their economies and that foreign direct investment inflow is higher, have higher rate of economic growth. Equally important, African economies seem to increase with fixed capital formation. Interestingly, population growth seems to have a strong positive impact on African economies. Population growth is always considered as a proxy for labour growth in many economies, thus its growth, without doubt, leads to higher economic growth.

Based on our results, exchange rate has a weak negative effect on real GDP per capita growth. The coefficients on exchange rate are either significant at 10 percent or insignificant across models. In addition, results show that the coefficient values of exchange rate are very small across models. More surprisingly, inflation rates seem to exert no influence on the overall rate of growth of GDP per capita over the sample period of 1996-2016.

In summary, the effect of the quality of institutions as revealed in this paper equally conforms to expectations. Pursuing policies of improving the qualities of voice and accountability, regulatory quality, political stability, government effectiveness, and rule of law together with controlling corruption are likely to enhance economic growth. Indeed, to be in the track of rapid economic growth, there is need for people to have more voice and political leaders to be accountable to people for Africa. Political stability and absence

of violence will significantly reduce costs of doing business, and hence promote growth of African economies. Also government effectiveness in terms of provision of public goods and caring for the vulnerable groups should be ensured in order to promote growth in the continent. Meanwhile, the positive effects of gross fixed capital formation, foreign direct investment and population confirm the relevance of augmented Solow model in explaining Africa's growth. In fact, investment in physical and human capital is important in promoting rapid growth in Africa. Furthermore, trade liberalization has been widely discussed in literature as one of the strongest determinants of growth not only in Africa but across the world. It is widely accepted that a combination of institutional factors and technological growth competitions offer a steady, smooth and speedy growth. Likewise, government regulations and support of private sector and foreign direct investment as well as reduction in trade restrictions have more impact on the economic growth.

TABLE 4. REGRESSION RESULTS: ARELLANO-BOND DYNAMIC PANEL-DATA ESTIMATION

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
GDP per capita growth, *Y(-1)*	-0.086***	-0.089***	-0.094***	-0.088***	-0.084***	-0.087***	-0.076**
	(0.03)	(0.03)	(0.03))	(0.03)	(0.03)	(0.03)	(0.03)
	[-2.49]	[-2.58]	[-2.75]	[-2.56]	[-2.46]	[-2.53]	[-2.22]
Degree of openness, *Trade*	0.083***	0.085***	0.090***	0.088***	0.087***	0.082***	0.077***
	(0.02)	(0.02)	(0.02))	(0.02)	(0.02)	(0.02)	(0.02)
	[4.47]	[4.57]	[4.84]	[4.70]	[4.66]	[4.39]	[4.15]
Gross fixed capita formation, *GFCF*	0.144***	0.140***	0.151***	0.148***	0.146***	0.145***	
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	
	[3.18]	[3.11]	[3.35]	[3.29]	[3.22]	[3.23]	
Population, *P*	3.111***	3.091***	3.014***	3.217***	3.102***	3.016***	2.903***
	(0.91)	(0.91)	(0.90)	(0.91)	(0.91)	(0.90)	(0.90)
	[3.42]	[3.41]	[3.35]	[3.54]	[3.42]	[3.34]	[3.22]
Inflation, π	-0.019	-0.019	-0.018	-0.020	-0.020	-0.020	-0.018
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
	[-1.18]	[-1.13]	[-0.08]	[-1.24]	[-1.21]	[-1.13]	[-1.09]
Exchange rate, *EX*	-0.003*	-0.003*	-0.003*	-0.003*	-0.003*	-0.003*	-0.002
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	[-1.57]	[-1.56]	[-1.82]	[-1.70]	[-1.82]	[-1.78]	[-1.13]
Control of corruption, *CC*	2.721*						
	(1.79)						
	[1.52]						
Government effectiveness, *GE*		3.709*					
		(2.23)					
		[1.66]					
Political stability, *PS*			2.963***				
			(0.97)				
			[3.06]				
Regulatory quality, *RQ*				3.838*			
				(2.04)			
				[1.89]			
Rule of law, *RL*					3.533*		
					(2.14)		
					[1.65]		
Voice and accountability, *VA*						2.806*	
						(1.85)	
						[1.52]	
Foreign direct investment, *FDI*							0.147***
							(0.53)
							[2.75]
Cons.	-11.68***	-10.77***	-11.91***	-11.55***	-11.03***	-11.02***	-13.19***
	(2.85)	(3.01)	(2.657)	(2.78)	(2.92)	(2.99)	(2.625)
	[-4.10]	[-3.58]	[-4.48]	[-4.16]	[-3.78]	[-3.69]	[-5.02]

TABLE 4. REGRESSION RESULTS: ARELLANO-BOND DYNAMIC PANEL-DATA ESTIMATION

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
No. of obs	912	912	912	912	912	912	912
No of group	48	48	48	48	48	48	48
No of instruments	197	197	197	197	197	197	197
Wald chi2(7)	108.05	108.80	116.61	110.16	108.41	108.63	108.63
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Regressions are estimated using panel data over the period 1996-2016 across 48 African countries. (.) denotes standard errors, [.] denotes t statistics and *, **, *** mean significance at the 10% , 5%, and 1% levels.
Source: Author estimates.

5. Conclusions and policy implications

This paper aimed at examining the relationship between institutions and economic growth in Africa. The paper used a sample of 48 African countries over the 1996-2016 period. Analysis of the paper included both institutional indices and structural factors. For inferential analysis, generalized methods of moment (GMM) and both fixed effect (FE) and random (RE) panel data model were applied. However, GMM was given emphasis mainly because of its power to analyze models with potential endogeneity problem. We conclude from the GMM results that institutions matter in promoting growth in Africa. Empirical results suggest that improvement in the quality of institutions is likely to increase rate of economic growth in Africa. Among the six institutional and governance indicators, political stability and absence of violence or terrorism is found to exert more effect on economic growth in Africa over the 1996-2016 study period. Other important factors for African economic growth include liberalization of trade, gross fixed capital formation, population growth and foreign direct investment. In fact, these control variables seem to exert strong influence on economic growth in Africa. By contrast, factors such exchange rate and inflation rate were found to have either very weak significant or insignificant effect on real GDP per capita growth in Africa over the period of study.

Empirical results of this paper have profound policy implications for African economies. Presence of political instability coupled with wide spread corruption and poor overall governance might have gone a long way to explain Africa's poor economic growth. Hence, breaking this vicious cycle and turning it into a virtuous one is in the realm of the African economist, researchers and policymakers. In fact, strengthening institutions in terms of enhancement of political stability, rule of law, democracy and accountability, control of corruption will lead to improvement in economic growth. Understandably, quality of institutions and governance is an important ingredient to ensure not only peace and political stability but are also a sound and smooth running inclusive economic growth and development. Pursuing the policies with the aim of improving political stability, government effectiveness, rule of law, voice and accountability, regulatory quality and control of corruption simultaneously would have more effect on economic growth in Africa than isolating them. However, quality of institutions and governance alone may not be sufficient. To ensure sustainable growth in Africa, reduction in trade restrictions, increase in gross fixed capital formation, and increase in foreign direct investment inflows as well as adequate investment in human capital (labour force) should also take place. Arguably, increase in investment in physical capital and degree of openness, become even more significant in explaining Africa's economic growth with better quality of institutions and governance.

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Appendix

TABLE 1a. REGRESSION RESULTS: FIXED EFFECT REGRESSION

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Trade	0.033**	0.034***	0.032**	0.033**	0.033**	0.032**	0.081***
	(0.01)	(0.01)	(0.01))	(0.01)	(0.01)	(0.01)	(0.01)
	[2.39]	[2.47]	[2.39]	[2.41]	[2.39]	[2.38]	[7.69]
GFCF	0.192***	0.189***	0.195***	0.193***	0.193***	0.192***	
	(0.03)	(0.03)	(0.03))	(0.03)	(0.03)	(0.03)	
	[5.78]	[5.68]	[5.87]	[5.81]	[5.79]	[5.76]	
PG	2.411***	2.414***	2.362***	2.422***	2.403***	2.368***	2.774***
	(0.50)	(0.49)	(0.49)	(0.50)	(0.50)	(0.50)	(0.50)
	[4.84]	[4.88]	[4.78]	[4.85]	[4.82]	[4.79]	[5.59]
π	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.02)	(0.00)
	[-0.30]	[-0.35]	[-0.14]	[-0.25]	[-0.27]	[-0.28]	[-0.01]
EX	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	[-0.94]	[-0.99]	[-1.26]	[-1.05]	[-1.03]	[-1.04]	[-1.31]
CC	0.676						
	(1.10)						
	[0.62]						
GE		1.857*					
		(1.24)					
		[1.49]					
PS			0.924*				
			(0.60)				
			[1.54]				
RQ				0.924			
				(0.60)			
				[1.54]			
RL					0.521		
					(1.23)		
					[0.43]		
VA						0.357	
						(1.09)	
						[0.33]	
FDI							0.056*
							(0.03)
							[1.72]
Cons.	-9.728***	-8.869***	-9.465***	-9.672***	-9.743***	-9.744***	-10.688***
	(1.61)	(1.72)	(1.58)	(1.62)	(1.67)	(1.755)	(1.57)
	[-6.05]	[-5.16]	[-6.00]	[-5.98]	[-5.83]	[-5.55]	[-6.82]
No. of obs	1008	1008	1008	1008	1008	1008	1008
No of group	48	48	48	48	48	48	48
R-squared:							
- within	0.130	0.131	0.131	0.130	0.129	0.129	0.101
- between	0.593	0.590	0.558	0.591	0.591	0.589	0.434
- overall	0.161	0.161	0.154	0.160	0.160	0.160	0.113
F(6, 954)	32.67	24.03	24.05	23.69	23.63	23.62	108.63
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Regressions are estimated using panel data over the period 1996-2016 across 48 African countries. (.) denotes standard errors, [.] denotes *t* statistics and *, **, *** means significance at the 10% , 5% , 1% levels.

TABLE 1b. REGRESSION RESULTS: RANDOM EFFECT REGRESSIONS

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Trade	0.017**	0.018**	0.017**	0.017**	0.016***	0.017**	0.051***
	(0.01)	(0.01)	(0.01))	(0.01)	(0.01)	(0.01)	(0.01)
	[2.24]	[2.36]	[2.30]	[2.29]	[2.23]	[2.25]	[7.08]
GFCF	0.180***	0.176***	0.182***	0.180***	0.181***	0.181***	
	(0.02)	(0.02)	(0.02))	(0.02)	(0.02)	(0.02)	
	[7.90]	[7.65]	[8.07]	[7.84]	[7.88]	[7.96]	
P	1.282***	1.368***	1.159***	1.248***	1.201***	1.234***	1.616***
	(0.32)	(0.31)	(0.28)	(0.30)	(0.31)	(0.29)	(0.31)
	[4.08]	[4.39]	[4.10]	[4.20]	[3.87]	[4.24]	[5.17]
π	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)
	[-0.16]	[-0.15]	[-0.27]	[-0.16]	[-0.20]	[-0.17]	[-0.31]
EX	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	[-0.84]	[-0.68	[-0.99]	[-0.88]	[-0.92]	[-0.92]	[-1.08]
CC	0.295						
	(0.51)						
	[0.58]						
GE		0.606					
		(0.49)					
		[0.25]					
PS			0.168				
			(0.31)				
			[0.55]				
RQ				0.245			
				(0.49)			
				[0.50			
RL					0.011		
					(0.47)		
					[0.02]		
VA						0.177	
						(0.39)	
						[0.45]	
FDI							0.056*
							(0.31)**
							[2.31]
Cons.	-5.806***	-5.791***	-5.818***	-5.776***	-5.781***	-5.754***	-5.690***
	(0.88)	(0.88)	(0.88)	(0.88)	(0.88)	(0.88)	(1.03)
	[-6.61]	[-6.618]	[-6.62]	[-6.58]	[-6.60]	[-6.54]	[-5.55]
No. of obs	1008	1008	1008	1008	1008	1008	1008
No of group	48	48	48	48	48	48	48
R-squared:							
- within	0.127	0.128	0.124	0.126	0.126	0.126	0.098
- between	0.616	0.617	0.624	0.617	0.618	0.616	0.444
- overall	0.165	0.166	0.165	0.165	0.164	0.165	0.115
Wald chi2(6)	194.43	195.86	196.22	194.32	194.19	194.29	121.42
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Regressions are estimated using panel data over the period 1996-2016 across 48 African countries. (.) denotes standard errors, [.] denotes t statistics and *, **, *** means significance at the 10% , 5% , 1% levels.
Source: Author estimate.