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Institutions and Economic Performance in Sub-Saharan Africa: A Dynamic Panel Data Analysis

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ABSTRACT

There is growing emphasis on the role of institutions and governance on explaining Africa's economic growth. However, it is not clear which of the institutions matter most. Therefore ,the objective of this paper is to answer two separate questions: (i) Do institutions really matter in Sub-Saharan Africa?, (ii) If institutions matter, which of them matters most? Arellano and Bond first difference and Blundell-Bond System Generalized Method of Moment (GMM) estimators were used to estimate the specified models. Our results show that, institutions really matter for Sub-Saharan Africa's economic performance, among which regulatory quality appeared to be the most important. Thus the economic performance of the region could be enhanced by improving regulatory quality.

Key words: Institutions, Dynamic Panel, Africa and Economic Growth
JEL Classification: O43, C33

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INTRODUCTION

Understanding why Sub-Saharan Africa is the poorest region and why many countries in the region are not converging with the rich countries has attracted a plethora of research. There is no consensus on what is actually responsible Africa's poor economic performance. Sachs and Warner (1997) as well as Hoeffler (2002) argued that Africa's poor economic performance can be explained by the same variables that account for the growth performance in other developing countries. Their results indicate that there is no systematic unobserved difference between African and non-African countries. This suggest that augmented Solow model can fully account for sub-Saharan Africa's slow growth performance. Therefore, to promote growth in Africa, attention should be given to the basic factors of the augmented Solow model, such as investment in physical and human capital and population growth. However, using the Solow growth model in cross-country studies, a number of authors find negative and significant impact of "African dummy" (see among others, Levine and Renelt, 1992; Sala-i-Martin, 1997a, 1997b; Barro, 1991, 1997; Bloom and Sachs 1998). This implies that "something else" rather than the Solow variables account for Africa's poor economic performance. In line with this argument, Easterly and Levine (2001) concludes that "something else" rather than capital accumulation accounts for the variances in growth across countries. Thus, despite the plethora of studies on growth, there still exist muddy areas.

Four separate theses seeking to explain growth differences across countries have emerged in recent time. These are the geography thesis, cultural and historical thesis, trade thesis and institution and policy thesis. The first argued that Africa is poor because of its geographical disadvantages while the second thesis argued that culture and historical antecedences put Africa at disadvantage, hence Africa cannot growth as fast as other regions. Trade literature argues that Africa is poorer because its trading lesser internationally, finally, the fourth thesis argues that weak institutions and wrong policy choice hinder Africa's growth.

However, there is growing emphasis on the role of institutions and governance on economic growth in recent time. The central message is that institutions which shape the incentive of economic actors matter for economic performance (see for example, North 1989, 1990, 1991; Mauro 1995; Knack and Keefer 1995; Hall and Jones 1999; Acemoglu, Johnson

and Robinson 2001, 2002, 2004; and Rodrik, Subramanain and Trebbi 2004; Pande and Udry 2006; and Huang 2010; among others). Based on this line of reasoning, the main conclusion is that institutions matter for growth. Thus, Sub-Saharan Africa (SSA) growth ordeal could be adduced to weak institutions. While we could easily accede to this conclusion, the vagueness of the concept of institution would still keep us in a muddle. Institution has several dimensions. Therefore, two separate questions deserved to be answered (i) do institutions really matter in Sub-Sahara Africa?, (ii) if institutions matter, which of them matter most? The quest for answers to these questions form the basis for this study. Therefore, the objectives of this study are; to

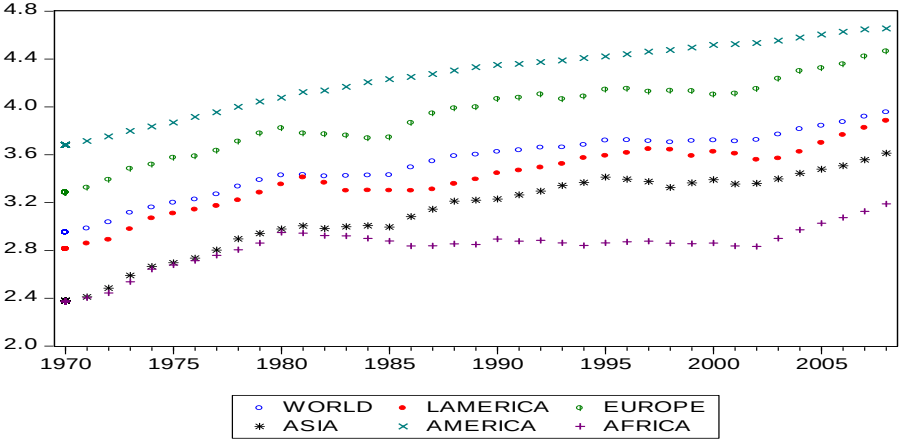
i. examine the impact of institutions on the economic performance of SSA
ii. examine which of the institution(s) matter most
iii. examine the relationship between the institutions and how they interact to influence growth in the region.

The remainder of the paper is arranged as follow. Section 2 presents brief overview of economic performance in Africa and sub-Sahara Africa. Section 3 presents the methodology, nature and sources of data, section 4 presents empirical results while 5 concludes the paper.

STYLIZED FACTS ON AFRICA ECONOMIC PERFORMANCE

This section presents economic performance in Africa, sub-Sahara Africa and other regions of world. Figure 1 presents the log of GDP per capita of Africa and other regions of the world, while figure 2 depicts log of GDP per capita of Africa, entire Sub-Sahara Africa, Sub-Sahara Africa excluding South Africa and Sub-Sahara Africa excluding South Africa and Nigeria.

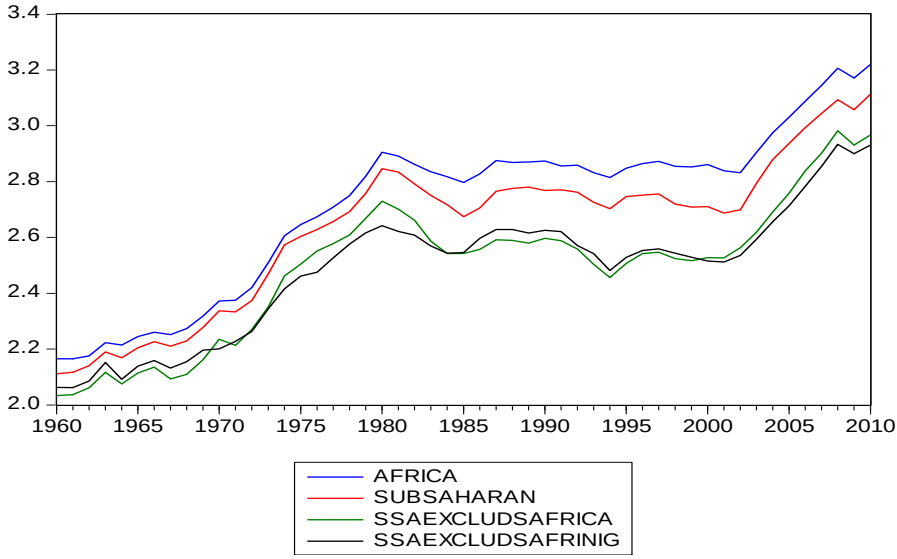
Figure 1: Log of Per Capita GDP of Different Regions



Source: Computed by the author from United Nations Data Base (2009)

In figure 1, North America has the highest per capita income (PCI) compared to any other region in the world and it maintained this leading position over the entire period considered. Europe is the second richest region in the world over same period. Only these two regions recorded income per capita that is above the World average PCI. Latin America and Caribbean PCI is close to the aggregate World average income level. The evolutional pattern of PCI in Latin America and Caribbean is similar to the World pattern. Asia and Africa were at the bottom of the income ladder in the 1970s. Starting from early 1980s Asia began to catch up and grew rapidly over the past three decades. Aggregate PCI in Asia is now close to the World average. If sub-regional performance is considered in Asia, the East Asia countries have more overwhelming performance in the continent. Africa PCI was growing gradually in the 1970s till early 1980s when it stagnated for about two and half decades. However, some progress have been recorded in recent time.

Figure 2: Log of Per Capita GDP of Africa (1960 to 2010)



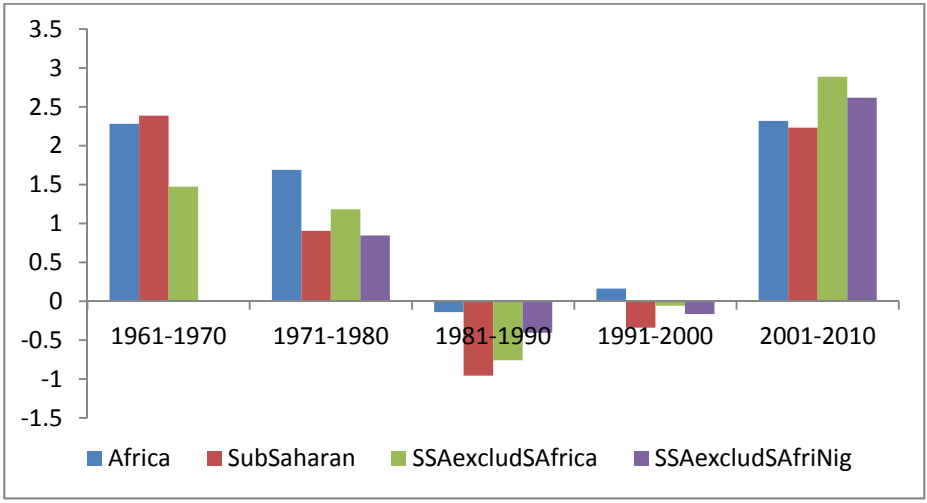
Source: Constructed by the authors from Africa Development Indicator (ADI), 2010

Figure 2 displays the log of per capita income of Africa as a whole, that is including North African countries (Africa), sub-Saharan Africa (SUBSAHARAN), sub-Sahara Africa excluding South Africa (SSAEXCLUDSAFRICA) and sub-Sahara Africa excluding South Africa and Nigeria (SSAEXCLUDSAFRINIG). It is obvious from the figure that Africa is richer than sub-Sahara Africa. This reflects the fact that North African countries are relatively richer than their sub-Saharan Africa counterparts. In other words, if North Africa is excluded from Africa sample, Africa is poorer. Similarly, sub-Sahara Africa excluding south Africa is poorer than the Sub-Saharan Africa. This means that South Africa is an economic giant in sub-Sahara Africa. However, when Nigeria is excluded from the sample it does not make any difference. It can be deduced that Nigeria's contribution to the income of sub-Sahara Africa is not significant.

Figure 3 below shows the growth rate of per capita income of Africa and its sub-regions. Between 1961 to 1970, the average growth of sub-Sahara Africa was higher than Africa's growth, however, if South Africa is excluded, sub-Sahara Africa growth is far below. The story is different between 1971 to 1980, Africa has the highest average growth

rate, follow by sub-Sahara Africa excluding South Africa. Sub-Sahara Africa and sub-Sahara Africa excluding South Africa and Nigeria had almost the same growth rate between 1971 to 1980, meaning that Nigeria is one of the fastest growing countries over the period. Africa and sub-Sahara Africa with and without South Africa recorded negative growth between 1981 to 1990, they started recovering in the period 1991 to 2000. In the decade 2001 to 2010, sub-Sahara Africa excluding South Africa recorded the highest growth rate, followed by sub-Sahara Africa excluding South Africa and Nigeria. This pattern reflect a number of stylized facts, first, the political crisis in North Africa affected Africa's growth, second, South Africa is experiencing recession may be as result of the global economic melt down, third, Nigeria is one of the fastest growing countries in the continent and fourth, some countries in sub-Saharan African are growing fast in recent time.

Figure 3 Average Growth of Per Capita GDP in Africa , 1961 to 2010



Source: Constructed by the authors from Africa Development Indicator (ADI), 2010

QUALITY OF INSTITUTIONS ACROSS AFRICA

The World Bank governance indicators which consist of six indexes are used as measures of institutions in this paper. These includes regulatory quality, voice and accountability, government effectiveness, political stability and absence of violence, rule of law, and control of corruption. All these indicators give the picture of governance performance of a country. Since the indicators are available

for all countries of the world, it is easy to compare governance across countries. Thus, in this section what each of the indicator measures as well as the performance of African countries are discussed.

Regulatory Quality measures the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Political stability and absence of violence is an index that measures the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence or terrorism. Rule of law measures the extent to which agents have confidence in and abide by the rules of society, in particular the quality of contract (private and government) enforcement, the police, and the courts, as well as the likelihood of crime and violence. Voice and accountability measures the extent to which a country's citizens are able to participate in selecting their government and to enjoy freedom of expression, freedom of association and free media. Participation by both men and women which means freedom of association and expression on the one hand and an organized civil society on the other hand is key to achieving voice and accountability. Government effectiveness measures the quality of public services, the quality and degree of independence from political pressures of the civil service, the quality of policy/project formulation and implementation, and the credibility of the government's commitment to policies. It also involves the extent of government responsiveness to issues which requires that all stakeholders are served within a reasonable timeframe. Finally, control of corruption measures the extent to which public power is exercised for private gain, including petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

These indicators are computed using the views of a large number of people including enterprises, citizens and experts survey on the quality of governance in all countries around the world. The value of each indicator ranges from 0 to 100 . The closer the value is to zero, the weaker the quality of governance and the closer it is to 100 the better the quality of institutions.

Table 1 presents fifteen year averages of real GDP per capita and measures of institutions of thirty six countries in Africa. Most of the countries that have the highest real GDP per capita among the thirty six countries also have high values of the measures of institutions. For example, Botswana, Mauritius and South Africa are part of the success story

in Africa's economic performance with average of US$8887.38, US$8179.004, and US$6451.51 per capita income respectively. On the other hand, Botswana ranked first in Africa in term of control of corruption, second in rule of law, regulatory quality, government effectiveness, and political stability and forth in voice and accountability. Mauritius occupied first position in voice and accountability, government effectiveness, regulatory quality, and rule of law, second position in control of corruption and third position in political stability. South Africa is often referred to as the economic giant of sub-Sahara Africa and it equally ranked high on all the indicators except political stability in which it occupies fifteenth position among thirty six countries considered in this paper.

Table 1: Fifteen (15) Year Averages of Indicators of Institutions and Real GDP

country	rgdppc	voiceacct	politicalsta	govteffect	regquality	rulelaw	concorruptn	inst
Angola	3199.62	11.78	18.24	10.77	10.25	5.78	4.98	10.30
Benin	1131.60	55.52	65.00	40.52	38.54	38.95	30.71	44.87
Botswana	8887.38	66.62	78.18	69.84	71.23	66.95	76.10	71.48
Burkina Faso	8887.38	35.74	41.44	27.74	43.28	35.90	50.93	39.17
Burundi	811.13	14.41	8.23	6.79	9.41	7.79	11.42	9.67
Cameroon	1682.45	16.06	26.41	22.83	22.77	12.07	14.44	19.10
Cape Verde	2782.53	70.82	78.92	54.88	45.51	57.27	58.55	60.99
Central African Republic	559.13	20.08	8.22	4.59	13.98	5.51	11.56	10.66
Comoros	962.54	32.50	40.62	4.85	8.39	14.75	20.03	20.19
Congo Kinshasa	215.19	5.46	1.09	1.91	4.07	1.23	2.02	2.63
Djibouti	2025.79	20.86	35.17	17.94	23.96	25.49	33.43	26.14
Eritrea	740.94	5.63	20.71	13.14	9.91	28.88	59.74	23.00
Ethiopia	482.52	17.19	11.53	23.43	15.59	25.03	29.19	20.33
Ghana	1609.61	51.54	42.36	53.28	44.39	48.43	53.97	48.99
guinea	804.12	12.55	11.48	13.62	18.37	8.42	21.37	14.30
Kenya	1141.52	34.48	16.11	34.26	42.28	17.85	16.06	26.84
Lesotho	1172.97	42.35	44.25	46.60	31.76	49.96	52.52	44.57
Madagascar	735.19	44.61	40.22	32.67	36.67	39.08	53.45	41.12
Malawi	505.16	40.07	40.11	28.08	35.36	41.69	38.37	37.28

Mali	841.35	53.41	50.63	24.11	38.84	40.94	36.50	40.74
Mauritius	8179.00	74.48	77.02	70.60	71.23	79.71	71.47	74.09
Mozambique	566.18	44.99	48.16	40.63	38.24	29.25	51.60	42.14
Namibia	4121.22	58.45	62.73	60.92	59.19	58.32	65.73	60.89
Niger	512.29	31.13	32.54	18.57	26.66	25.52	18.19	25.44
Nigeria	1424.18	23.80	9.02	15.03	18.73	9.45	9.74	14.29
Rwanda	762.77	38.96	45.54	48.46	47.77	50.06	56.63	47.90
SAO TOME AND PRINCIPE	1366.51	59.87	67.47	45.18	45.66	48.72	51.73	53.11
Senegal	1336.06	50.01	43.61	35.42	42.36	43.11	41.59	42.68
SEYCHELLES	25331.43	40.61	49.43	51.26	29.85	40.63	42.49	42.38
South Africa	6451.51	69.86	42.12	64.17	55.89	50.89	60.65	57.26
Sudan	1673.53	11.68	7.37	10.16	14.92	8.28	8.12	10.09
Swaziland	3407.07	12.27	31.61	22.09	28.99	18.34	36.67	25.00
Tanzania	869.76	24.84	21.28	24.70	22.46	24.69	18.89	22.81
Togo	759.08	33.38	41.87	30.81	39.75	37.24	43.44	37.75
Uganda	921.06	24.62	12.83	24.59	38.18	24.98	16.63	23.64
Zambia	1130.61	41.79	43.99	37.10	34.68	40.13	39.22	39.48

Source : computed by authors

METHODOLOGY AND DATA ISSUES

The augmented Solow growth model given in equation 1 below is adopted in this paper as baseline model.

$$\begin{aligned}\ln y_{(t)} - \ln y_{(0)} = {} & -(1 - exp^{-\pi t})\ln y_{(0)} + (1 - exp^{-\pi t})\ln A_{(0)} \\ & + (1 - exp^{-\pi t})\,\alpha/(1 - \alpha - \gamma)\ln(s_k) \\ & + (1 - exp^{-\pi t})\,\gamma/(1 - \alpha - \gamma)\ln(s_h) \\ & - (1 - exp^{-\pi t})\,\alpha + \gamma/(1 - \alpha - \gamma)\ln(n + g + \delta) \qquad (1)\end{aligned}$$

The panel data specification of the Solow growth model from equation 1 is given as:

$$\ln\Delta y_{it} = \gamma + \alpha_i + \beta_t + \delta\ln y_{it-1} + \pi\ln sk_{it} + \theta\ln sh_{it} + \rho\ln(n_{it} + g + \delta) + v_{it} \qquad (2)$$

Where $\Delta \ln y_{it}$ is the log of change in income of country i at time t, γ is a constant representing $(1 - exp^{-\pi t}) \ln A_{(0)}$, α_i is individual country unobserved effect, β_t is time effect, δ is the convergence coefficient, $\ln y_{it-1}$ is log of lag of income, π measures the share of physical capital, that is $(1 - exp^{-\pi t})\, \alpha/(1 - \alpha - \gamma)$, while $\ln sk_{it}$ is log of per capita physical capital. The share of human capital $(1 - exp^{-\pi t})\, \gamma/(1 - \alpha - \gamma)$ is represented by θ, $\ln sh_{it}$ is log of human capital, ρ represents $-(1 - exp^{-\pi t})\, \alpha + \gamma/(1 - \alpha - \gamma)$, n_{it} is population growth, g is growth of technology, δ is depreciation and v_{it} is the random error term.

Equation 2 is estimated as the baseline model, which is thereafter augmented with institutional variables and the model becomes:

$$\Delta \ln y_{it} = \gamma + \alpha_i + \beta_t + \delta \ln y_{it-1} + \pi \ln sk_{it} + \theta \ln sh_{it} + \rho \ln(n_{it} + g + \delta) + \mu X_{it} + v_{it} \quad (3)$$

Where X_{it} is a vector of institutional variables of interest. Different versions of equation 3 are estimated, the case where X_{it} enters the model as Hicks neutral variable and the case where it enters augmenting physical capital as well as human capital respectively.

The a- priori expectations are: δ and ρ should be negative while π, θ and μ are expected to be positive. Negative δ means that poorer countries in sub-Sahara Africa are converging with the rich countries in the sub region, on the other hand, positive δ means the poorer countries are diverging.

Estimation of dynamic panel growth model (such as we have in equations 2 and 3) posed big challenge to growth researchers, consequently led to the evolution of growth econometrics. If these models are estimated with OLS, the individual unobserved effect α_i will correlate with lag of income y_{it-1}, hence the estimate will be biased upward. Even if α_i is omitted, the inclusion of y_{it-1} will cause OLS to be biased and inconsistent. Researchers have tried many alternative estimation techniques over time, these included the use of Within Groups estimator, Arellano-Bond first difference GMM (Generalized Method of Moments) estimator and Blundell – Bond System GMM estimator respectively. However, Nickell (1981) shows that using Within Groups Estimator in a dynamic panel model will also provide biased and inconsistent estimates. While OLS is biased upward, the Within Groups estimator gives downward biased estimates of the coefficients.

Similarly, Blundell and Bond (1998) show that the first difference GMM estimator may be subject to a large downward finite sample bias. Blundell, Bond and Windmeijer (2000), Bond, Hoeffler and Temple (2001), Hoeffler (2002) argued that using first difference GMM estimator to estimate dynamic growth regression can be poorly behaved and suggest the use of system GMM instead. Arellano and Bover (1995) and Blundell and Bond (1998) show that the system GMM is an improvement over the first difference GMM.

In this paper, the two dynamic panel model estimators (First difference GMM and System GMM) that have been widely used in the literature are exploited. Bond, Hoeffler and Temple (2001) argued that one of the strengths of GMM approach, particularly System GMM, is its potential for obtaining consistent parameter estimates even in the presence of measurement error and endogenous right hand side variables. As long as the first difference of the endogenous variable is uncorrelated with individual specific effects, the lagged values of first difference of the endogenous variable can be a suitable instrument. Since both the first – difference GMM and System GMM take first difference in order to eliminate the individual effects, then lagged values of endogenous variables dated $t - 2$ and earlier can be used as instruments so as to obtain consistence results. The validity of these instruments can be tested using the Sargan test for over-identifying restrictions. The Arellano-Bond test for autocorrelation in first differenced errors as well as higher order autocorrelations are also computed.

The data for this paper are sourced mainly from African Development Indicator (ADI), Penn World Table and World Bank Databank respectively. The definitions and sources of variables are given in table 2 below. Data on each variable are collected over the period 1996 to 2010 for 36 countries in sub-Sahara Africa.

Table 2: Definitions and Sources of Variables

Variable	Definition	Source
$\Delta \ln y_{it}$	Change in log of Real GDP per capita,	Pen World Table
$\ln sk_{it}$	Log of investment as share of GDP	Pen World Table
$\ln sh_{it}$	Log of total secondary school enrolment	ADI and WDI
n_{it}	Change in log of total population	ADI and Pen World Table
X_{it}	World Bank governance indicators	World Bank Data Bank

Following the practice in the literature (see for example Mankiw, Romer and Weil (1992), Islam (1995), Caselli, Esquivel and Lefort (1996) and Hoeffler (2002)) technological progress g and depreciation rate δ are assumed to be constant across countries and that they sum up to 0.05, that is $g + \delta = 0.05$. Therefore, the sum of population growth and 0.05 gives values for $(n_{it} + g + \delta)$. The vector X_{it} include voice and accountability (voiceacct), political stability (polsta), government effectiveness (govteff), regulatory quality (regqual), rule of law (rulelaw), control of corruption (concor) and the average value of the six indicators(inst).

PRESENTATION AND DISCUSSION OF RESULTS

The correlation results presented in table 3 and figures A1 to A7 give rough idea of kind of relationship that exist between measures of institutions and economic performance. Table 3 shows the correlation matrix of the relationship between log of GDP per capita and all the explanatory variables of our model. Secondary school enrolment, and investment as share of GDP have positive relationship with income per capita while population growth has negative association with income. All the indicators of institutions have positive correlation with log of per capita income. These correlations are also evidenced in figure A1 to A7 in the appendix of the paper.

Among the Solow variables, human capital proxied by secondary school enrolment has the strongest relationship (0.73) with income. The correlation between physical capital and income is though positive but is weak (0.32), while population growth has a strong negative correlation (0.75) with income. Among the six indicators of governance of the World Bank, political stability and government effectiveness have the strongest relation with correlation values of 0.62 each. This is followed by 0.54 correlation values for rule of law and control of corruption. Regulatory quality has the weakest relationship (0.49) with income and finally voice and accountability has the second weakest of 0.51 value.

The regression results are presented in Tables 4a to 6b. The results on the impact of individual indicator of institutions on growth are in tables 4a and 4b, while impact of interaction between the indicators of institutions on growth are presented in tables 5a and 5b and tables 6a and 6b present results of robustness test. In Tables 4a and 4b, results columns are labelled 1 to 8. In column 1 results of the baseline model specified in equation 2 is reported, while 2 to 8 report results of different versions of equation 3. In column 2 institutional variable enters the model as Hicks neutral augmenting variable. In column 3 to 8,

the six governance indicators are controlled for, each at a regression. The Arellano-Bond first different GMM regressions did not perform well with significant Sargan tests in all the results, thus, the results are not reported. However, Blundell-Bond system GMM regressions perform well with no significant Sargan test, therefore, only system GMM results are reported in the paper. We estimated both the one step and two step procedures of the system GMM but only the two step procedure results are reported.

DISCUSSION OF RESULTS

In all the regressions sargan test is not significant, meaning that we do not reject the validity of over identifying restriction. Equally the Arellano-Bond test for autocorrelation show that there is no evidence of high order autocorrelation in all the regression. All the regressors are significant in the baseline model. The aggregated measure of institutions is significant at 5% as reported in column 2. The individual indicators of institutions are not significant except regulatory quality and rule of law. Most of the interactive terms are not significant except five which include interaction between regulatory quality and voice and accountability, political stability and rule of law as well as interaction of political stability with government effectiveness and rule of law. When measure of openness is introduced, aggregate institutions, voice and accountability, political stability and rule of law came out insignificant while government effectiveness, regulatory quality and control of corruption are significant. However, when openness is interacted with the institutional variables all the indicators of institutions came out significant.

In all the regressions, the coefficients of physical capital came out with significant and positive, which conforms with the a priori expectation. Human capital is positive and significant in all the regression, population growth is negative and significant, these equally conforms with expectations. These results confirm the relevance of augmented Solow model in explaining Africa's growth. Investment in physical and human capital is important in promoting rapid growth in Africa. The results also indicate that control of population growth is a necessary prerequisite to promote economic growth in the continent.

Among the six indicators of institutions regulatory quality and rule of law stand out to be more important institutional factors that matter most in Africa growth performance. Meaning that growth in Africa can be accelerated if the quality of institutions particularly regulatory quality and rule of law are improved.

Results of the interactive terms show that pursuing combined policies of improving the qualities of voice and accountability, regulatory quality, political stability, government effectiveness, and rule of law. There is need for people to have more voice and political leader to be accountable to people for Africa to be in the track of rapid growth. Political stability and absence of violence will significantly reduce costs of doing business, and hence promote growth.

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. There is also need for government to regulate and support the private sector. Results of the robustness tests show that all indicators of institutions are significant after interacting them with openness. This means that if a country opens up her economy for international trade and other relationship, institutional factors would have more impact on the economic performance of such country.

CONCLUDING REMARKS

This paper revisited the institutions growth argument by addressing three issues: does institutions matter in Africa? If yes which of them matters most and what is the interaction effects of institutions on growth. We conclude from the empirical results, particularly the system GMM results that: (i) institutions matter in promoting growth in Africa. That improvement in the quality of institutions will increase growth rate in SSA. (ii) Regulatory quality and rule of law are the most important among the six indicators of institutions considered in the paper. (iii) pursuing the twin policies of improving levels of voice and accountability, rule of law and political stability simultaneously with improving regulatory quality would have more effect on growth than isolating them. Combination of political stability with government effectiveness, and rule of law would also have significant impact on growth. (iv) In addition to improvement in quality of institutions, four other variables seem to matter for Africa's growth too, increase in investment in physical and human capital, openness and reduction in population growth. Finally (v) institutional factors become even more important with openness.

Table 3: Correlation Matrix

	lnregdppc	lsrgdp	Ssenrol	Popg	Voiceacct	Polsta	Govteff	Regqual	Rulelaw	Concor
lsrgdp	0.32									
Ssenrol	0.73	0.43								
Popg	-0.75	-0.25	-0.61							
Voiceacct	0.51	0.10	0.55	-0.36						
Polsta	0.62	0.25	0.60	-0.45	0.75					
Govteff	0.62	0.13	0.60	-0.46	0.81	0.74				
Regqual	0.49	0.004	0.45	-0.32	0.77	0.62	0.85			
Rulelaw	0.54	0.17	0.58	-0.40	0.82	0.83	0.90	0.81		
Concor	0.54	0.19	0.56	-0.45	0.66	0.76	0.82	0.69	0.87	
inst	0.61	0.16	0.62	-0.45	0.89	0.87	0.94	0.86	0.96	0.89

Source: Computed by authors

Table 4a: Blundell and Bond System GMM Results, dependent variable is $\Delta \ln y_{it}$

	1	2	3	4	5
$\ln y_{it-1}$	0.9821* (0.0070)	0.9793* (0.0060)	0.9821* (0.0092)	0.9731* (0.0098)	0.9729* (0.0074)
$\ln sk_{it}$	0.0296* (0.0049)	0.0301* (0.0051)	0.0329* (0.0057)	0.0283* (0.0656)	0.0326* (0.0047)
$\ln sh_{it}$	0.0108** (0.0042)	0.0101** (0.0043)	0.0072*** (0.0042)	0.0122* (0.0045)	0.0117* (0.0034)
$\ln(n_{it} + g + \delta)$	-0.0119* (0.0028)	-0.0097* (0.0020)	-0.0100* (0.0029)	-0.0084* (0.0019)	-0.0121* (0.0029)
$\ln inst_{it}$		0.0080** (0.0042)			
$\ln voiceacct_{it}$			0.0012 (0.0040)		
$\ln polsta_{it}$				0.0008 (0.0019)	
$\ln govteff_{it}$					0.0046 (0.0028)
const	0.0323 (0.0415)	0.0263 (0.3337)	0.0308 (0.0521)	0.0946*** (0.0564)	0.0729 (0.0456)
wald test	81164*	123063*	166442*	71599*	118627*
sargan test	31.7879	31.8500	30.8842	30.9684	30.3221
AB test	-1.3709	-1.3886	-1.399	-1.131	-1.3833
No. Obs.	504	504	504	496	504

*significant at 1%, **significant at 5%, ***significant at 10%, standard error in parenthesis, AB test is Arellano and Bond test for autocorrelation. Source: computed by authors

Table 4b: Blundell and Bond System GMM Results, dependent variable is $\Delta \ln y_{it}$

	6	7	8
$\ln y_{it-1}$	0.9783* (0.0058)	0.9873* (0.0054)	0.9886* (0.0092)
$\ln sk_{it}$	0.0287* (0.0055)	0.0281* (0.0060)	0.0257* (0.0057)
$\ln \mathrm{sh}_{\mathrm{it}}$	0.0109** (0.0046)	0.0063** (0.0028)	0.0073 (0.0052)
$\ln(\mathrm{n}_{\mathrm{it}} + \mathrm{g} + \delta)$	-0.0115* (0.0034)	-0.0090* (0.0022)	-0.0078* (0.0026)
$\ln \mathrm{regqual}_{\mathrm{it}}$	0.0093* (0.0026)		
$\ln \mathrm{rulelaw}_{\mathrm{it}}$		0.0054** (0.0026)	
$\ln \mathrm{concor}_{\mathrm{it}}$			0.0028 (0.0022)
const	0.0313 (0.0383)	-0.0056 (0.0252)	-0.0031 (0.0550)
wald test	22267*	114064*	77025*
sargan test	32.5705	31.2905	31.9972
AB test	-1.3249	-1.3815	-1.3400
No. Obs.	502	504	500

*significant at 1%, **significant at 5%, ***significant at 10%, standard error in parenthesis, AB test is Arellano and Bond test for autocorrelation. Source: computed by authors

Table 5a: Interaction Effects, Blundell –Bond GMM Results, dependent variable is $\Delta \ln y_{it}$

$\ln y_{it-1}$	0.9787* (0.0061)	0.9734* (0.0091)	0.9774* (0.0087)	0.9745* (0.0070)	0.9878* (0.0080)	0.9751* (0.0071)	0.9781* (0.0066)	0.9786* (0.0082)
$\ln sk_{it}$	0.0259* (0.0042)	0.0321* (0.0055)	0.0294* (0.0047)	0.0287* (0.0051)	0.0281* (0.0055)	0.0266* (0.0050)	0.0239* (0.0066)	0.0258* (0.0050)
$\ln sh_{it}$	0.0106* (0.0035)	0.0111** (0.0043)	0.0089*** (0.0051)	0.0108** (0.0046)	0.0053 (0.0043)	0.0121* (0.0028)	0.0110* (0.0035)	0.0129 (0.0042)
$\ln(n_{it} + g + \delta)$	-0.0075* (0.0019)	-0.0124* (0.0029)	-0.0119* (0.0032)	-0.0121* (0.0026)	-0.0090** (0.0039)	-0.0063* (0.0018)	-0.0070* (0.0019)	-0.0070* (0.0017)
$\ln voiceacct * polsta_{it}$								
$\ln voiceacct * govteff_{it}$	-0.0014 (0.0020)							
$\ln voiceacct * regqual_{it}$		0.0025 (0.0018)						
$\ln voiceacct * rulelaw_{it}$								
$\ln voiceacct * concor_{it}$			0.0040* (0.0019)					
$\ln polsta * govteff_{it}$				0.0020 (0.0017)				
$\ln polsta * regqual_{it}$					0.0020 (0.0014)			
$\ln polsta * rulelaw_{it}$								
const						0.0023*** (0.0012)		
wald test							0.0024** (0.0011)	
sargan test								0.0017** (0.0008)
AB test					-0.0015 (0.0487)			
No. Obs.	0.0782*** (0.0457)	0.0710 (0.0521)	0.0464 (0.0494)	0.0774 (0.0538)	95016* 32.3982 -1.3459 500	0.0716 (0.0515)	0.0598 (0.0463)	0.0841 (0.0539)
	67525*	119808*	114266*	61161*		75956*	63415*	85116*
	29.8397	30.5573	32.0720	30.0873		32.3401	32.9716	31.8353
	-1.1241	-1.3793	-1.3317	-1.3603		-1.1356	-1.1092	-1.1212
	496	504	502	504		496	496	496

*significant at 1%, **significant at 5%, ***significant at 10%, standard error in parenthesis, AB test is Arellano and Bond test for autocorrelation. Source: computed by authors

Table 5b: Interaction Effects, Blundell-Bond GMM Results, dependent variable is $\Delta \ln y_{it}$

$\ln y_{it-1}$	0.9789* (0.0057)	0.9793* (0.0049)	0.9765* (0.0051)	0.9754* (0.0078)	0.9853* (0.0087)	0.9809* (0.0072)	0.9766* (0.0080)
$\ln sk_{it}$	0.0307* (0.0035)	0.0290* (0.0052)	0.0317* (0.0041)	0.0349* (0.0071)	0.0258* (0.0055)	0.0273* (0.0052)	0.0280* (0.0055)
$\ln sh_{it}$	0.0150* (0.0029)	0.0101** (0.0041)	0.0105* (0.0032)	0.0079** (0.0032)	0.0067*** (0.0037)	0.0112** (0.0057)	0.0126** (0.0059)
$\ln(n_{it} + g + \delta)$	-0.0072* (0.0019)	-0.0116* (0.0028)	-0.0120* (0.0027)	-0.012* (0.0028)	-0.0096* (0.0024)	-0.0112* (0.0024)	-0.0111* (0.0022)
$\ln polsta * concor_{it}$	-0.0015 (0.0013)						
$\ln govteff * regqual_{it}$							
$\ln govteff * rulelaw_{it}$		0.0033 (0.0022)					
$\ln govteff * concor_{it}$			0.0010 (0.0023)				
$\ln regqul * rulelaw_{it}$				0.0021 (0.0015)			
$\ln regqul * concor_{it}$					0.0039** (0.0020)		
$\ln rulelaw * concor_{it}$							
const						0.0017 (0.0014)	
wald test							0.0016 (0.0013)
sargan test				0.0616 (0.0486)			
AB test	0.0478 (0.0364)	0.0348 (0.0286)	0.0617** (0.0366)		0.0064 (0.0469)	0.0354 (0.0532)	0.0599 (0.0537)
No. Obs.	87271*	208353*	128491*	186411*	82312*	77158*	89039*
	31.5710	31.7754	29.0343	31.3000	30.5502	31.2315	30.6074
	-1.1605	-1.369	-1.3806	-1.3537	-1.3153	-1.3246	-1.3289
	496	502	504	500	502	500	500

*significant at 1%, **significant at 5%, ***significant at 10%, standard error in parenthesis, AB test is Arellano and Bond test for autocorrelation. Source: computed by authors

Table 6a: Significant of Institutional Variable in Presence of Openness

$lnopen_{it}$	0.0323*	0.0328*	0.0320*	0.0419*	0.0242***	0.0318*	0.0300**
	(0.0110)	(0.0121)	(0.0109)	(0.0139)	(0.0138)	(0.0104)	(0.0129)
$lninst_{it}$							
$lnvoiceacct_{it}$	0.0041						
	(0.0041)						
$lnpolsta_{it}$		0.0038					
		(0.0037)					
$lngovteff_{it}$			-0.00006				
			(0.0016)				
$lnregqual_{it}$				0.0054***			
				(0.0030)			
$lnrulelaw_{it}$					0.0077*		
					(0.0024)		
$lnconcor_{it}$						0.0017	
						(0.0033)	
							0.0022**
							(0.0011)

Table 6b: Interactive Effects of Institutions and Openness

$\text{lninst} * \text{open}_{it}$	0.0093** (0.0045)
$\text{lnvoiceacct} * \text{open}_{it}$	0.0106* (0.0035)
$\text{lnpolsta} * \text{open}_{it}$	0.0061* (0.0020)
$\text{lngovteff} * \text{open}_{it}$	0.0080** (0.0034)
$\text{lnregqual} * \text{open}_{it}$	0.0140* (0.0037)
$\text{lnrulelaw} * \text{open}_{it}$	0.0071** (0.0028)
$\text{lnconcor} * \text{open}_{it}$	0.0042** (0.0022)

*significant at 1%, **significant at 5%, ***significant at 10%, standard error in parenthesis, AB test is Arellano and Bond test for autocorrelation. Source: computed by authors

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Appendix A

Figure A1: log of GDP per capita versus Voice and Accountability

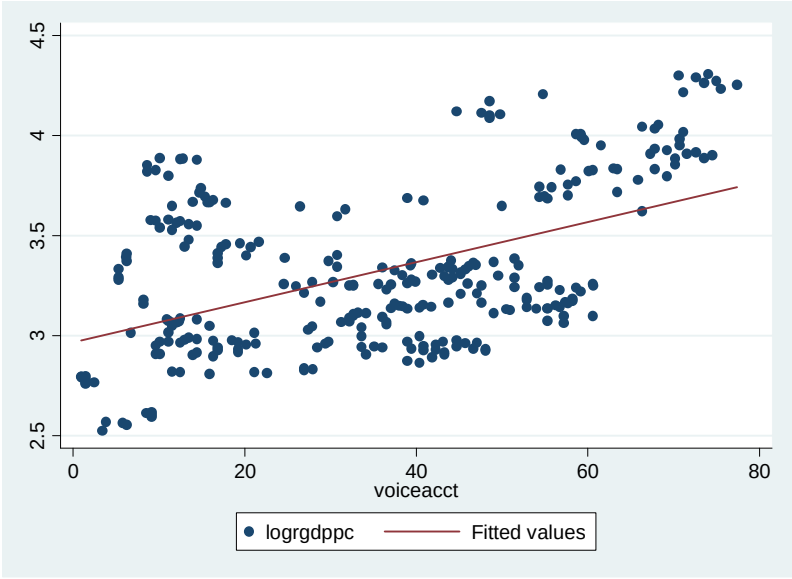


Figure A2: log of GDP per capita versus Political Stability

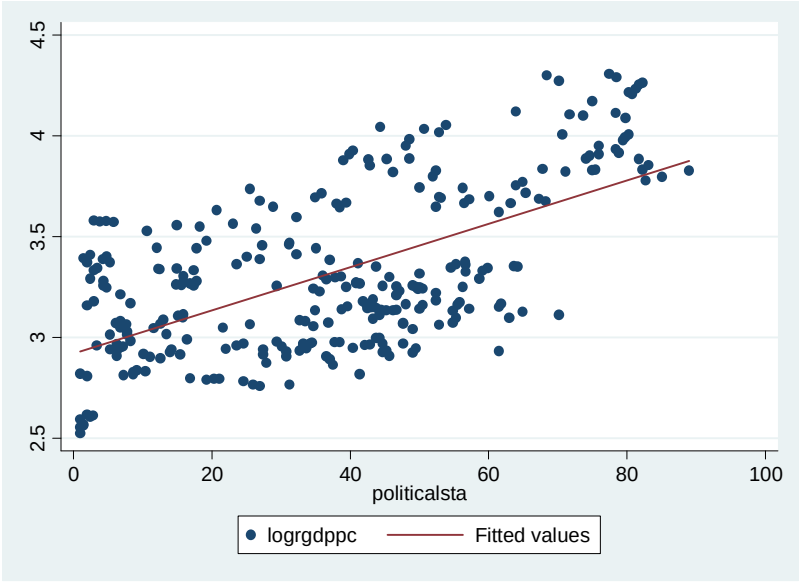


Figure A3: log of GDP per capita versus Government Effectiveness

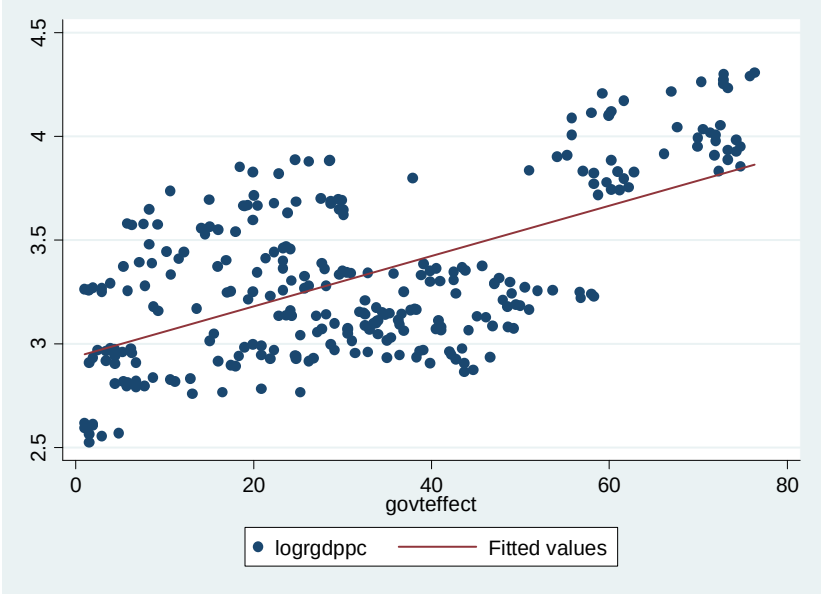


Figure A4: log of GDP per capita versus Regulatory Quality

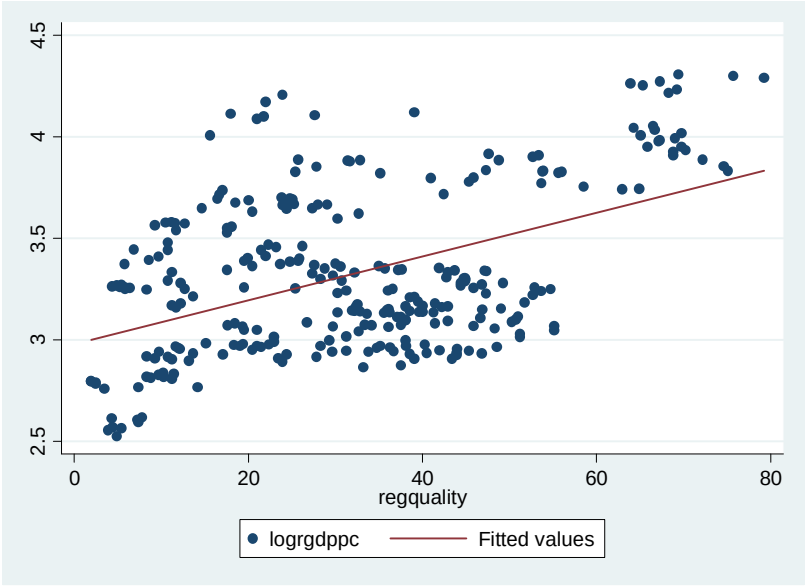


Figure A5: log of GDP per capita versus Rule of Law

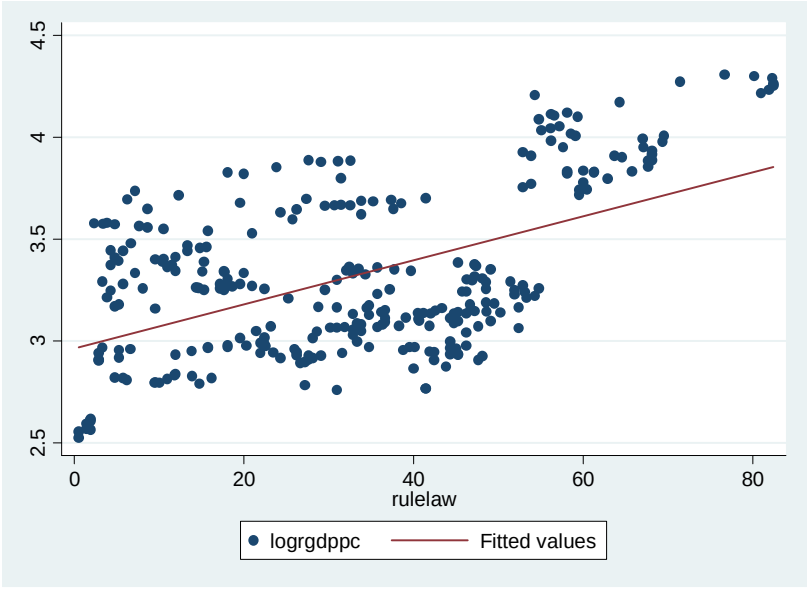


Figure A6: log of GDP per capita versus Control of Corruption

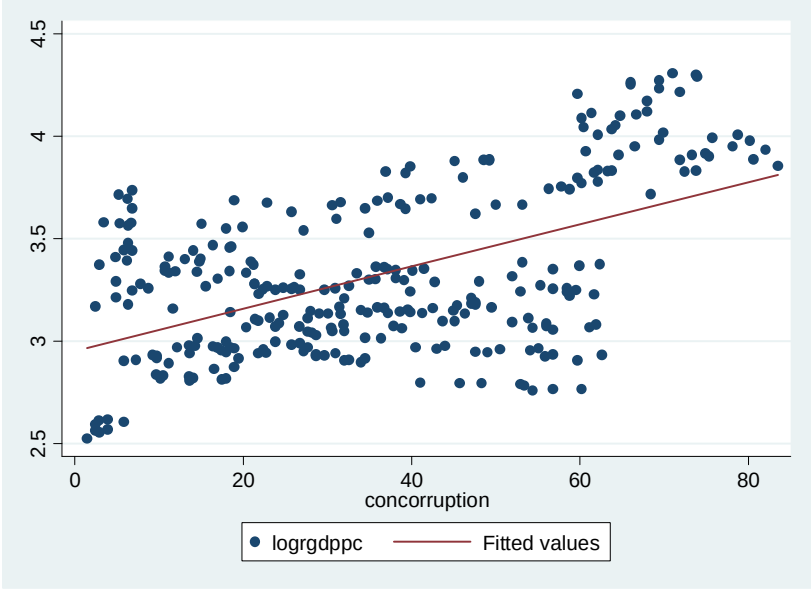
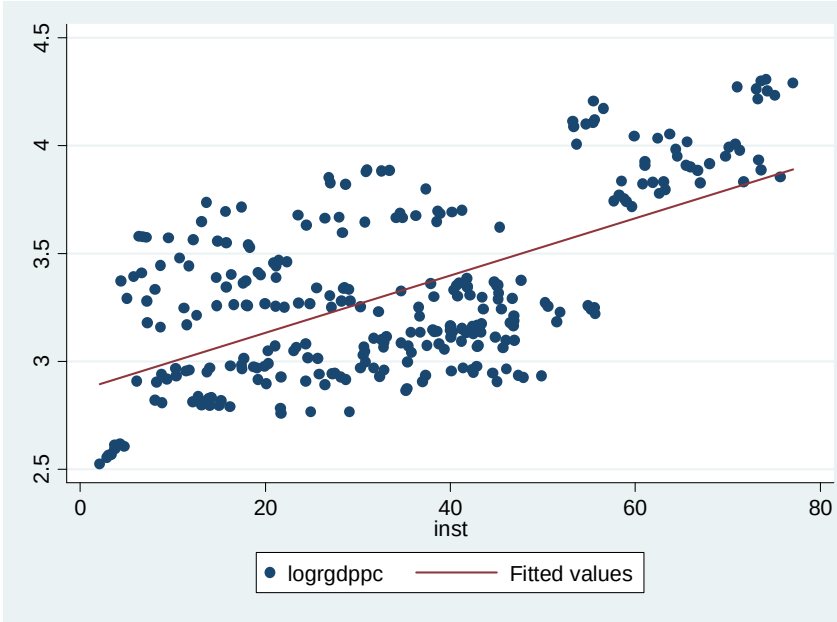


Figure A7: log of GDP per capita versus Average value of the six indicators


4.5
4
3.5
3
2.5
0
20
40
60
80
inst
logrgdppc
Fitted values