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Roles of Governance in Explaining Economic Growth in Sub-Saharan Africa

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Abstract:

Sub-Saharan Africa (SSA) has been growing at very low rates over the past few decades. The roles of malfunctioning institutions, geographic misfortune, and lack of integration in explaining this have been the subject of much debate. This article assesses the role of institutions in explaining the slow growth of Africa. In addition, it explores one of the possible transmission channels — aggregate technical inefficiency — through which institutions affect economic growth. In order to evaluate the impact of institutions on economic growth, the classical growth models have been estimated using difference and system generalized method of moments (GMM) using data from thirty-five selected SSA countries from 1996 to 2005. Rule of law, government effectiveness, regulatory quality, political instability, and voice and accountability are found to influence the growth of SSA. However, control over corruption has no relation to growth in the continent. Using stochastic frontier analysis, this study found that only two aspects of governance —regulatory quality and government effectiveness — matter in influencing technical efficiency. Political aspects of governance—voice and accountability and political instability—have no relation to technical efficiency. Therefore, Sub-Saharan Africa's poor economic performance (slow growth and aggregate technical inefficiency) can in part be attributed to bad governance.

Keywords: Growth, Technical Inefficiency, Institutions/Governance, GMM, Stochastic frontier analysis

Introduction

Africa's share in the global economy has declined drastically during the past 50 years in terms of gross domestic product (GDP), exports, and foreign direct investment. For instance, its share in the global GDP has declined from around 3.5 percent in 1950 to 2.5 percent in 2000. The decrease in Africa's share of world export and foreign direct investment is even more drastic.

Export as a percentage of world export declined from about 7 percent to 2 percent in these five decades, while foreign direct investment declined from 5.5 percent to 1 percent in the same period. The decline of the continent's importance in the global economy is much sharper in terms of its relations with the rest of the world than purely in terms of economic activity. Its share of global GDP in purchasing power parity terms fell by one-third between 1950 and 2000, but its share of world exports shrank by two-thirds.[2]

B.J. Ndulu and S.A. O'Connell calculated simple cross-country averages, which, at best, suggest a story of modest growth of the continent during the period from 1960 to 2000.[3] However, non-African growth consistently outpaced African growth after 1960, with the result that Sub-Saharan Africa's real incomes fell by more than 35 percent relative to incomes in other developing regions and by nearly half relative to industrial countries. Another study by R. Paap et al. also tried to address the question of whether Sub-Saharan African countries have lower average growth rates in real GDP per capita than countries in Asia, Latin America, and the Middle East.[4] Contradicting the results of Ndulu and O'Connell, Paap et al. found that not all African countries (included in their analysis) were performing poorly. They asserted that one out of four African countries had growth rates that matched those of many Asian and Latin American countries. Therefore, there are no clear-cut, continent-specific clusters in the growth of nations. However, the fast-growing countries (Congo Republic, Cape Verde, Gabon, Lesotho, Mauritius, Malawi, Seychelles, and Zimbabwe) account for a small proportion of the total population of the continent.

Whichever the case may be, a number of explanations were given as to why some regions, especially those located in the tropics, were growing at very low rates. W. Easterly and R. Levin summarized these arguments into three groups.[5] First, the geography fundamentalists emphasize endowments (tropics, germs, and crops). Institutionalists, on the other hand, argue that institutions are the result of tropical location and the cultural differences that forced Europeans to build either "extractive" colonies (such as in Africa and Latin America) or "settler" colonies (such as in North America and Australia). Finally, policy fundamentalists focus on policies, which include sound macroeconomic policies, openness to international trade, and absence of capital account control. D. Rodrik et al. cite a fourth argument postulated by trade fundamentalists who emphasize integration to the global economy as an engine of growth.[6]

Institutions, as defined by D.C. North, "are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction."[7] In consequence they structure

incentives in human exchange, whether political, social, or economic. North continues with his analysis of institutions by redefining them as a form of humanly devised constraints to shape human interactions. These constraints could be formal or informal. Formal constraints include the rules that human beings devise, while informal ones are conventions and codes of behavior. The major role of these institutions in a society is to reduce uncertainty by establishing a stable (but not necessarily efficient) structure to human interaction.

Explaining Africa's Economic Growth: the Role of Institutions

Various rationalizations were given for Africa's extremely lower growth rates. These include: lack of social capital, lack of openness to trade, deficient public service, unfavorable geography and risk, lack of financial depth, and high aid dependence. The continent is said to be characterized by ethnolinguistic fractionalization and inequality, divorce of the government from the masses, uncontrolled corruption, and lack of other social capital. The public sector is also characterized by low returns. All these factors have created a capital-hostile environment in Africa that lowers the rates of return on investment.[8]

W.H. Masanjala and C. Papageorgiou used Bayesian model averaging methodology to answer the question of whether Africa grows differently to the extent of warranting a separate theory of growth.[9] They found that Africa indeed grew differently during the period from 1960 to 1992. The determinants and the mechanisms through which these determinants influence Africa's growth are different from those of the rest of the world. In other words, the growth models that best explain global growth do poorly in explaining African growth and vice versa. Except for the initial output level, variables flagged as important in explaining the global pattern of economic growth lose their significance for an Africa-only sample. In addition, variables that were insignificant in explaining global growth are found to be very significant in explaining African growth. The variables that turn out to significantly affect the growth of Africa are share of GDP in mining, the fraction of primary commodities in exports, years for which the countries have been open, revolutions and coups, and investment, according to Masanjala and Papageorgiou. However, other studies (for example, by A. Hoeffler and by P. Collier and J.W. Gunning) claim that growth in Africa is explained by the same fundamental factors as in the rest of the world.[10] Africa's slow growth is thus partly explicable in terms of particular variables that are globally important for the growth process but are low in Africa, according to Collier and Gunning.

Even if the determinants of growth were the same, their marginal impact on growth would be

different from that of the rest of the world. That is, the relative importance of regressors differs between Africa and the rest of the world. Actually, only two variables emerge as having common importance in the global and Africa-only samples, namely initial level of income and the ratio of investment to GDP. Openness, reliance on primary commodity export, mining, and revolution and coups are important in explaining Africa's growth tragedy. It is also important to note that except revolutions and coups, other measures of institutional quality such as religion, ethnolinguistic fractionalization, the rule of law, civil liberties, and political rights are found to be not pertinent in explaining Africa's growth tragedy, as explained by Collier and Gunning.

J.D. Nkurunziza and R.H. Bates analyzed the impact of democracy and political stability on Africa's growth.[11] They found that democracy and political stability are good for economic growth in Africa. The impact of tenure (political stability) on growth varies with the level of democracy. Incumbents who served long terms may produce more economic damage in democratic than in authoritarian political systems. Their result suggests that for a given level of democracy, there is an optimal period of tenure beyond which an incumbent leader harms economic growth.

Political instability as proxied by successful coups, abortive ones, and coup plots play a very great role in the growth of Africa. A.K. Fosu suggested that abortive coups have a greater chance of creating uncertainty in the political and economic atmosphere relative to successful ones.[12] This is because the existing government usually resorts to harsh measures (like a declaration of state of emergence, imprisonment, or even the execution of the accused) to deal with the perpetrators of an abortive coup. Coup plots probably have a similar, but less intensive, effect compared to failed ones. Therefore, the adverse effect of abortive coups is more pronounced.

Both the level and productivity of the production inputs are adversely affected by coup events. Political instability adversely affects capital productivity, while labor productivity is affected very little by such events. Thus the major transmission channel via which political instability affects the growth of Africa is the deterioration in marginal productivity of capital.[13]

The preceding studies on cross-country growth analysis involved the primacy of the role of institutions over geography and trade in influencing countries' growth globally. There is no consensus on this issue, and the area is still open for detailed scrutiny. Even those studies focusing on the impact of institutions in explaining Africa's growth are characterized by some weaknesses in the methodology they utilize to explain a complex process such as economic growth. Cross-section Ordinary Least Squares, Random Effects, and Fixed Effects panel

estimations were the major methods used by the authors. However, such methods are flawed (see the discussion later in this article). To address the methodological limitations of the previous studies, this article adopts difference and system GMM estimation technique to estimate the growth models. These techniques enable us to get consistent estimates of the growth models.

In addition, institutions could influence growth of nations directly or indirectly via some transmission channels. This article, therefore, tries to trace one of the channels — technical inefficiency — through which poor institutions translate into slower growth.

Hypotheses

The study presented in this article hypothesizes that governance plays an indispensable role in explaining the slow growth of countries in Sub-Saharan Africa. There is also a difference in the significance of various aspects of governance in explaining Africa's slow growth. After raising these points and testing them, the next logical step is to trace the channels of transmission through which bad governance translates into unsatisfactory economic performance. Therefore, we hypothesize that aggregate technical efficiency is one of the major channels via which institutions/governance affect the economic growth of countries in Africa.

Methodology

Method of Analysis

Typically, the empirics of long-run economic growth have been based on a cross-section regression framework using average data for long periods, say twenty-five or thirty years. This method has limitations as it suffers from the problem of endogeneity; averaging a time series variable implies that not all information is utilized; single equation cross-section regressions are likely to suffer from omitted variable biases.[14] The right hand–side variables are typically endogenous and measured with error.[15] A dynamic panel data approach addresses these limitations.[16]

Hoeffler[17] proposed first difference generalized method of moments (DIF-GMM) suggested by M. Arellano and S. Bond[18] and system generalized method of moments (SYS-GMM) estimator by Blundell and Bond (1998)[19] in estimating dynamic growth models. Both GMM estimators address the bias problems encountered in single-equation cross-section regressions, because in a dynamic panel data model we will be able to account for unobserved country-specific effects and allow for the endogeneity of one or more of the regressors. Bond et al.[20] also argue that "the

potential for obtaining consistent estimates even in the presence of measurement error and endogenous right hand–side variables is a considerable strength of the GMM approaches in the context of empirical growth research." Hoeffler[21] used Sargan tests and found the SYS-GMM estimator to be more efficient than the DIF-GMM estimator, provided that some restrictions are valid.

This article investigates the role of institutions in explaining Africa's slow economic growth and traces one of the possible channels of transmission — technical inefficiency — through which institutions influence growth. To this end, the classical growth models (the original Solow[22] and its augmented version suggested by Mankiw, Romer, and Weil, henceforth MRW[23]) augmented with institutions are estimated using the (difference and system) GMM techniques in a panel context. To avoid the bias problems associated with the cross-section specification and the ordinary least squares estimation of the panel specification, this study estimates the panel specification using difference and system GMM techniques that are considered to be the best available method to avoid the bias problems.[24]

As mentioned above, the channels through which bad governance translates into lower income are diverse. Not only accumulation of factors of production but also the extent to which a country is utilizing the resources efficiently determines growth in its income. Efficiency is one possible channel through which governance affects the economic growth of nations. To trace this channel, a stochastic frontier approach is adopted in the study presented in this article. In the stochastic frontier approach, technical inefficiency measures how close a country's production is to what the country's optimal production would be for using the same bundle of inputs. To find the inefficiency scores of countries, first a production frontier is estimated, providing a benchmark for each country regardless of its inputs. Then, the inefficiency score is computed by comparing the optimal output per worker with the effective output per worker.[25] This study explains the inefficiency scores of Sub-Saharan Africa countries with institutions, controlling for geography, educational attainment of the population, and historical factors.

Data Source

Data for thirty-five selected Sub-Saharan African countries is analyzed in this study. The data is taken from different sources. Data on real GDP, investment, population growth, labor force, land area, and classification of countries into different income groups are taken from the World Bank's 2006 World Development Indicators, while data on Enrollment in secondary schools (as a proxy

for human capital formation) is taken from UNESCO. The list of landlocked countries and data on the former colonizers' identity are taken from Wikipedia. Data on indicators of governance, such as rule of law, control of corruption, voice and accountability, political stability, government effectiveness, and regulator quality are taken from World Bank governance data.[26] The meaning of these indictors is discussed below.

Discussion of Results

The governance quality of countries as indicated by the subjective perception of individuals is clustered into the six indicators introduced above. "Voice and accountability" refers to the process by which government is selected and replaced. This measures the aspects of the political process, civil liberties, and political rights, as well as the extent to which citizens of a state are able to participate in selection of their governments. "Political instability" captures the probability that the incumbent government will be destabilized or overthrown by possible unconstitutional and violent means. "Government effectiveness" assesses the quality of public service provision, the quality of bureaucracy, the competence of civil servants, the independence of civil service from political pressure, and the credibility of the government's commitment to policies. A related indicator of governance is "regulatory burden/quality," which focuses more on the policies themselves. It measures the incidence of market-unfriendly policies like excessive control over prices and foreign trade regulation or inadequate bank supervision. "Rule of law" and "control of corruption" together evaluate the respect of citizens and the state for the institutions that govern their interactions. Rule of law measures the extent to which agents have confidence in and abide by the rules of society. That is, it measures the incidence of crime, the effectiveness and predictability of the judiciary, and the enforceability of contract. Corruption is defined as the exercise of public power for private gain. The prevalence of corruption is a manifestation of the lack of respect of both the corrupter and the corrupted for the rules that govern their interactions.[27]

The six governance indicators are measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance quality. These indicators may overlap. Where there is strong rule of law, the public may refrain from bribing government officials. This is affirmed by the strong pair-wais correlation between 'rule of law and corruption variables (around 0.82). Again it is more likely that the users of public-sector service may not opt to resort to corruption when public-service provision is of high quality and there is modest bureaucratic red tape. The large correlation coefficient (about 0.79) between government effectiveness and corruption variables justifies such an argument. Government effectiveness and rule of law are also highly correlated

(with a correlation coefficient of 0.86). This strong positive relation between the two institutional qualities is expected as a government committed to its policies and providing adequate public service can develop the confidence of the public in the rules governing the society. Therefore, including more than one of these indicators in the growth regression simultaneously may create a problem of multicollinearity. Accordingly, this study uses these indicators individually and compares the importance of each in influencing Africa's growth.

Real GDP, real GDP per capita, and investment are measured in US dollars using 2000 as a base year. Population growth rate (n) is measured as the annual percentage change of the total population, while labor force (Labor) measures the total number of people in the working age bracket. Enrollment in secondary schools (school) indicates the total number of students enrolled in all grades in secondary schools. Total land area (Land) is measured in square kilometers. The landlocked dummy (LLockedD) is equal to one for landlocked countries and zero for countries with access to the sea, while the British dummy (BritishD) equals one for former Great Britain colonies and zero for others. The landlocked-British colonies dummy (llB) is equal to one for those landlocked countries that have been under the British Empire and zero otherwise. The income group dummy (IGD) is equal to one for countries in the low income group and zero for African countries in the upper and lower middle income bracket.

African countries included in this analysis on average achieved below zero in governance scores. The best governance score was assigned to Mauritius, Botswana, and South Africa, while the Democratic Republic of Congo has been governed very badly. A closer look at the countries with relatively high and low governance scores (for example, Mauritius, Botswana, and South Africa on the one hand and the Democratic Republic of Congo on the other) would better highlight how countries' governance quality is related to incomes.[28] The Democratic Republic Congo was the most politically unstable country in the period covered, with an average score close to the least feasible value of -2.5. The regulatory quality of the country has also been inferior, as low as -2.04, and the country has been scoring below zero on all indicators of governance quality in all the years under analysis. However, Mauritius, Botswana, and South Africa, which are the best-governed countries in Africa, scored positive values in almost all aspects of governance. The per capita incomes of these countries are relatively higher than that of the Democratic Republic of Congo. The average per capita incomes (from 1996 to 2005) of Mauritius, Botswana, South Africa, and the Democratic Republic of Congo are around U.S. $10,000, $8,500, $9,000, and $650 per annum. However, this analysis does not tell us whether there is a causal relation between institutional quality and income as there could actually be divergence in resource endowment,

population growth rate, and decisions concerning investment. These factors are controlled for (are included as explanatory variables) in a regression analysis in the next section.

Growth and Governance in Sub-Saharan Africa

To assess the relevance of institutions in explaining Africa's slow growth, the original Solow growth model and its augmented version are estimated using DIF-GMM and SYS-GMM from the data on thirty-five selected African countries (from 1996 to 2005). In these classical models, investment and population growth (as well as human capital formation) are controlled for. As a matter of fact, these are not all the variables that need to be controlled for: integration to the global economy and geography are some of the factors that should have been accounted for. The GMM approaches treat the covariates such as investment and population growth as potentially endogenous and generate internal mechanisms of instrumenting them.[29] The Sargan test for the null hypothesis of valid specification is used to test whether these instruments are valid.[30] The test failed to reject the null hypothesis in all the regressions implying that the instruments are valid. The Wald test for joint significance of the dependent variables strongly rejected the null hypothesis that the coefficients on all the variables are jointly equal to zero (see Table 1).

Most of the standard determinants of growth have the expected sign and enter significantly, supporting the previously held hypothesis about the effects of each of the variables on the growth of nations (see Table 1).[31] The first regressor, $\log(GDP_{t-1})$, is the lagged value of real GDP per capita (in logarithm) and serves as a proxy for the initial condition. Previous growth studies found that the coefficient of this variable is negative and significant showing conditional convergence in the income level of countries. Holding population growth and investments (as well as schooling) the same, poor and rich countries tend to converge in terms of per capita GDP.[32] The negative and significant coefficient of the lagged GDP per capita in this study is also in line with the convergence hypothesis.[33]

Theory also suggests that those countries that save and invest more are expected to have higher growth in income per capita. The positive and significant coefficient of log (investment) in most of the regressions is in line with this theory. The composite variable $\log(n+g+d)$ represents population growth rate, depreciation rate, and the rate of technological progress. The latter two variables are assumed to sum to 5 percent in all countries. Therefore, the composite variable is simply the logarithm of population growth augmented with 0.05. Higher population growth lowers income per capita as the available capital must be spread more thinly to the working population.[34]

However, the coefficient of the population growth rate variable is insignificant in all specifications and estimation techniques. Therefore, population growth rate does not explain the low income per capita in African countries.

Enrollment in secondary schools (log school) serves as a proxy for human capital formation. Increased investment in human capital is expected to affect income per capita positively. Countries with better educated citizens can easily adopt new technologies and innovate new technology domestically and hence grow more rapidly.[35] Usually, this variable turns out to be insignificant as enrollment is poorly measured.[36] In the DIF-GMM estimation, the coefficient for schooling is negative in some of the regression and is insignificant in some other cases, while it is positive and significant when the Augmented Solow Model is estimated using SYS-GMM.

Table 1: Summary of Estimation Results of Solow and Augmented Solow Growth Models Using Difference and System GMM[37]

$\log(GDP_t)$	Solow Model				Augmented Solow Model			
	Difference GMM		System GMM		Difference GMM		System GMM	
	Coeff.	(Std. Err.)	Coeff.	(Std. Err.)	Coeff.	(Std. Err.)	Coeff.	(Std. Err.)
$\log(GDP_{t-1})$	.8268	(.02663)***	.9942	(.00369)***	.8275	(.02615)***	1.000	(.01068)***
log(Investment)	.0053	(.00237)**	.0092	(.00190)***	.0061	(.00241)**	-.0039	(.00810)
log(n+g+d)	-.0004	(.00107)	-.0018	(.00176)	-.0004	(.00096)	-.0018	(.00191)
log(school)					-.0007	(.00091)	.0110	(.01044)
Voice	.0444	(.00655)***	.0162	(.00313)***	.0478	(.00476)***	.0173	(.00536)***
Stability	.0158	(.00093)***	.0113	(.00383)***	.0154	(.00377)***	.0257	(.00869)***
Corruption	.0004	(.00913)	.0052	(.00564)	.0041	(.00844)	.0176	(.00667)***
GovEff	.0284	(.00668)***	.0080	(.00363)**	.0338	(.00773)***	.0188	(.00387)***
RegQ	.0580	(.00847)***	.0165	(.00418)***	.0602	(.00773)***	.0158	(.00509)***
RuleLaw	.0297	(.00850)***	.0184	(.00561)***	.0305	(.00999)***	.0226	(.00414)***

Cons_	.0076	(.00092)***	-.1181	(.05072)**	.0078	(.00097)***	-.0298	(.05937)
Number of countries	35		35		34		34	
Number of obs.	105		210		102		170	
	Ch2-stat	p-value	Ch2-stat	p-value	Ch2-stat	p-value	Ch2-stat	p-value
Wald test of joint signf.	1397.30		206930	0.000	1562.66		551055.88	0.000
First order autocorr.	-2.14	0.0322	2.24	0.025	2.16	0.0309	-2.20	0.027
Second order autocorr.	-2.14	0.2863	-1.12	0.261	-1.04	0.2961	-1.59	0.111
Sargan test	18.51	0.5540	14.72	0.325	18.24	0.5716	11.42	0.493

Notes: *Each of the indicators of governance quality is included in the twenty-four regressions one at a time. This table simply summarizes the coefficient and the standard error on the indicators of governance quality taken from the respective regressions (the coefficients of the standard determinants vary across the regressions, but we are simply reporting the results from one of the twenty-four regressions).*

*The *, **, and *** indicate that the corresponding coefficients are statistically significant at 10 percent, 5 percent, and 1 percent level of significance.*

This study does not focus on the standard determinants of growth, which here function as control variables. Rather, the interest of this study is in presenting the possible impact of poor institutions in explaining the slow economic growth of African countries. Africa appears to be poorly governed (at least in the period under analysis). As discussed above, African countries have on average scored negative in terms of Kaufman et al.'s indicators of governance quality, which run from about -2.5 to 2.5 with higher values representing better institutional quality.[38]

The regression results show how governance affects growth in Africa. The coefficients of the governance quality indicators (voice and accountability, political instability, regulatory quality, government effectiveness, and rule of law) are all positive and strongly significant under different specifications and estimation techniques. However, corruption is insignificant, except under the system GMM estimation of the Augmented Solow Model. This finding supports the hypothesis that Africa's slow economic growth can partially be attributed to bad governance. Those African countries with better governance, as indicated by a higher governance score assigned to them by Kaufman et al.,[39] have higher real income per capita than those that are poorly governed, controlling for investment, population growth, and human capital formation.

These results robustly support the hypothesis that Africa's slower growth can partially be explained by poor governance. The continent appears to lack the necessary institutional qualities that foster growth. This has resulted in the extremely slower growth prevalent in African countries. The finding is consistent with previous studies.[40] Africa's slow growth is thought to be due to lack of the necessary social capital, the divorce of the government from the masses, and deficient

public service.[41] The determinants of growth in Africa are found to be different from that of the rest of the world, and institutions are among the unique determinates of the continent's growth.[42]

Attaining good governance in every aspect may be very costly for African countries. Thus, African countries could focus on some of the institutional qualities that matter most in explaining growth. The significance (as well as the size) of the coefficients on the governance indicators helps us in identifying the dimensions of governance that influence African growth most. Among the governance quality indicators developed by Kaufman et al.,[43] control of corruption has no effect on economic growth in Africa — the coefficient of this variable is insignificant in all estimation techniques and specifications, except under the SYS-GMM estimation of the Augmented Solow Model. This finding is comparable with the "greasing the wheel hypothesis," which proposes that in a country plagued with excessive bureaucratic red tape corruption may serve as the grease to help the system work properly.[44] Other governance indicators turn out to be statistically significant and hence are important in influencing growth in the subregion. As noted above, however, attaining good governance in every aspect is practically impossible for African countries. Therefore, governments can concentrate their efforts on some aspects of governance such as maintaining rule of law and improvement of regulatory qualities, which are found to be quite crucial for economic growth in the part of Africa below the Sahara Desert. In other words, the results suggest that Africa's governments should put much investment in improving the quality of bureaucracy and the competence of civil servants, ascertaining the independence of civil service from political pressure, and ensuring the credibility of the government's commitment to policies, the effectiveness and predictability of the judiciary, and the enforceability of contracts.

A bird's-eye view of endowments, political systems, and economic growth of the Democratic Republic of Congo, a country with one of the worst governance statuses, and of Botswana, a country acknowledged as being well-governed in the continent, may enable us to provide baseline support to the results from the regression analysis. The Democratic Republic of Congo hosts almost half of Africa's forests as well as extraordinary mineral wealth that could make it the most prosperous country in the continent. Despite this overwhelming potential, the country is facing huge development challenges. The Congolese suffered from a long period of misrule and two devastating civil wars claiming the lives of four million people. These disrupted the economic, social, and governance fabric of the country leaving it with a per capita income of U.S. $650 per annum and a negative economic growth rate (at least during 1996 to 2000), despite the huge resource endowment. Botswana is also a country of relatively large mineral and animal resources. Unlike in the Democratic Republic of Congo, Botswana is a politically stable country and

characterized by multiparty democracy. It is rated as one of the best-governed countries in the continent by many internationally recognized institutions such as Transparency International, the World Bank, Mo-Ibrahim Foundation, and others. This contributed to a relatively larger per capita income and economic growth rate greater than 5 percent in the period under analysis.

Tracing the Transmission Channels: Technical Inefficiency

Growth accounting decomposes output growth into the contribution of changes in factor inputs and of total factor productivity.[45] This study considers total factor productivity as one of the major channels through which bad governance translates into slower economic growth, specifically whether governance affects growth through total factor productivity (technical inefficiency) or through other channels of transmission such as investment. Accumulation and productivity are taken as the major factors accounting for the growth differences among nations. The evolution of productivity may actually be the leading driving force of growth. Hence, what matters for growth is not only the amount of factors of production a country is endowed with and has accumulated, but also, and mainly, the way those factors are combined.[46] The channels through which poor governance translates into slower growth and lower per capita income are numerous and mostly yet to be discovered.[47]

This study discusses aggregate level technical inefficiency (leaves accumulation/investment for future research) as a possible channel through which bad governance is translated into slower growth or lower income. To this end a two-stage stochastic frontier analysis (SFA) is used. In this approach, first the production function is estimated, and the inefficiency score of each country for all years is predicted. [48] In the second stage, the inefficiency score generated in the first step is explained with covariates. This is the two-stage approach towards measuring and explaining inefficiency. In addition to institutions, geography variable (being landlocked), colonizers' identity (British dummy), investment in human capital (school), combined dummy for British colonial heritage and geographic misfortune (landlocked), and income group dummy are used to explain inefficiency.

The stochastic production frontier is estimated using maximum likelihood technique (see Table 2). The frontier, which is a time varying decay model, converges after fifty iterations. The Wald test for joint significance of the inputs to production strongly rejects the null that the coefficients are jointly equal to zero. To check whether the production frontier is actually a stochastic frontier, the null hypothesis that the variance in technical inefficiency is zero is tested. The test statistic (t=3.93)

indicates that the null hypothesis is strongly rejected. This implies that the frontier is actually a stochastic frontier. Therefore, we can proceed with estimating the parameters related to source of inefficiency within the context of SFA.[49] The inefficiency model (see Table 3) explains the variation in technical inefficiency across African countries.

Table 2: Estimates of the Production Frontier

log(GDP)	Coef. (Std. Err.)
log(land)	0.218(.0504594)***
log(labor)	0.171(.0669834)**
log(capstock)	0.452(.0350391)***
_cons	77.25(361.6341)
Sigma_u2	0.287(.0732848)***
Sigma_v2	0.005(.0004172)***

Notes: *Number of iteration: 50; Number of observation: 350*
Wald Ch2: 318. Prob>Chi2=0.000
Log Likelihood=313

Table 3: Summary of Results from the Technical Inefficiency Model

Inefficiency	Coef. (Std. Err.)
LLockedD	1.071(.4796974)**
IGD	-0.174(.3994566)
BritishD	2.003(.5599835)***
School	0.000(1.00e-08)**
llB	-2.230(.8326909)***
RuleLaw	-0.002(.0307187)
RegQ	-0.082(.0194061)***

GovEff	-0.057(.0258351)**
Corruption	-0.046(.0240203)*
Stability	0.028(.0204742)
Voice	0.038(.0284196)
_cons	77.251(361.6341)

Notes: *Number of observation: 170; Number of groups: 34*

Overall R-sq = 0.3359

Wald chi2 (6) = 22.65 Prob > chi2 = 0.0009

Like the summary of the growth regression results, this table summarizes the six technical inefficiency regression results. The governance variables enter one at a time in the mean inefficiency models. The coefficients on the control variables and test statistics slightly vary across the different regressions and the ones reported here are from one of the regressions.

*The *, **, and *** represent that the corresponding coefficients are statistically different from zero at 10 percent, 5 percent, and 1 percent level of significance.*

The technical inefficiency scores are explained (see Table 3) by running Generalized Least Squares estimation (in a Random Effects setting), where the dependent variable comprises the inefficiency scores. The sign of coefficients on the variables used to explain the technical inefficiency tells us whether the variable is improving efficiency or not. Positive, significant coefficients imply that inefficiency increases with the increase in the magnitude of the variables and that the country is moving further away from the frontier, and vice versa.

Countries with access to the sea have the opportunity to import more efficient techniques from the technological leaders and integrate with the rest of the world at much lower cost. One can, therefore, expect these countries to be more efficient and closer to the frontier than landlocked countries. The positive and significant coefficient of landlocked countries dummy supports this argument. Landlocked countries are further away from the frontier — less efficient — than those African countries with access to the sea (see Table 3).

Developed countries have unmeasured externalities in the form of better infrastructure, greater market orientation of the economy, and so on that make them more efficient.[50] All countries in Sub-Saharan Africa are classified as developing by the World Bank. To account for the minor differences in level of development of the countries, this study uses the World Bank classification of countries into different income groups.[51] The coefficient on this dummy is insignificant in all the inefficiency models. The result does not support the above theory and could be due to the small

variation in the level of development among Sub-Saharan African countries. The result is expected from a statistical point of view as there is less variation in the data across countries; around 75 percent of the countries in our sample are classified as low income.

Countries with highly educated manpower are expected to be more able to adapt to a changing economic environment and fill the technological gap between them and the leading technological country. This reduces the distance from the frontier and hence improves the countries' efficiency.[52] The proxy for human capital — enrollment in secondary schools — enters significantly with the wrong sign in some of the regressions. This could be, as discussed above, due to a measurement problem as enrollment is poorly measured.[53]

N. Nunn and others have explained Africa's underdevelopment by linking it to the effect of colonial heritage, the colonizers' identity, and the lasting impacts on Africa's growth.[54] These studies, however, have not clearly stated the impact of colonialism on aggregate technical inefficiency of the ex-colonies. To the best of our knowledge, there is no research linking colonizers' identity to its effects on aggregate technical efficiency of the former colonies. However, B. Yu linked agricultural productivity with colonial heritage.[55] The coefficient of the dummy variable for former British and Portuguese colonies indicates that base efficiency (in the agricultural sector) is substantially lower than the reference group — French Colonies.[56]

To assess the effect of colonial heritage on aggregate technical efficiency of African economies, this study includes a Great Britain dummy (BritishD) and a dummy combining geography (Landlocked) and colonial heritage (British influence) — (llB) — as a control variable in the technical inefficiency model. The British dummy turns out to be positive and strongly significant. Therefore, the ex-British colonies are located further away from the frontier relative to the French and other colonies. The llB is negative and significant — the British colonies located further away from the coast are more efficient than those with access to the sea and those that had been under other colonizers. The inefficiency of the former British colonies relative to others may be due to policy followed in controlling the colonies — indirect rule — and the imposition of wrong curricula of education on the subjects.[57] R. Dumont, when discussing the effects of colonial heritage on African growth, argued that the education curricula inherited from the colonial "mother" has been obstructionistic.[58] As a result, those with formal education are unfit for productive work in industry and agriculture. The worst contribution of the British educational system, for instance, has been that the educated look down the most-needed work in Africa — agriculture.

Of the six governance variables, two (regulatory quality and government effectiveness) enter significantly with the expected sign in the inefficiency model. Thus, controlling for historical and geographic factors, countries with better regulatory quality, effective government, and less corrupt civil servants are more efficient. This finding is in line with that of Olson et al. and Adkins et al.[59] Productivity growth is higher in better governed countries.[60] As discussed above, Adkins et al. found that economic freedom significantly influences efficiency.[61] However, political freedom does not have any relation with technical efficiency. The insignificant coefficient on "voice" and "stability" — political variables — is in line with the findings of Adkins et al. Rule of law is not related to technical efficiency either. Therefore, the latter three aspects of governance qualities are affecting growth through other transmission channels, say through investment.

Conclusion and Policy Recommendations

It can be concluded that Africa's slow growth can in part be attributed to bad governance —governance significantly influences economic growth in the continent. There is also a difference in the importance of various governance dimensions. There is a large difference among aspects of governance in influencing technical efficiency. Regulatory quality, government effectiveness, and control of corruption are associated with efficiency with expected sign. Voice and accountability, political instability, and rule of law do not have a relation with aggregate technical efficiency. The latter governance indicators could be affecting economic growth through other transmission channels, possibly through accumulation of factors of production.

Therefore, political instability, lack of civil liberty and political rights, the poor quality of public service provision and the less competent civil servants, extended bureaucracy, market-unfriendly policies, and the absence of rule of law are the fundamental factors behind Africa's slow economic growth. The continent is growing slowly not only because of geographic misfortune and lack of integration with the global economy but also due to the prevalence of malfunctioning institutions. This negative impact of bad governance on economic growth, in part, runs through the aggregate technical inefficiencies rampant in African countries. Weak public service provision, the incompetence of the civil servants, and market-unfriendly policies contribute to technical inefficiency and hence the slow growth of economies in Sub-Saharan Africa. Therefore, improving the qualities of these institutions would foster total factor productivity and hence economic growth.

Making policy inference from a panel data analysis that lumps together thirty-five countries might be problematic. To avoid generic policy stance, one has to analyze data on each country or group

of countries (at similar levels of development). However, at this juncture in time we have limited data (running from 1996 to 2005), and 75% of the countries are classified as lower income. As a result, econometric analysis based on this limited data would be flawed. Keeping this limitation in mind, the policy implications of the results are discussed below. In this study, institutions have been found to have significant impact on economic growth in Sub-Saharan African countries. The result suggests that instead of concentrating all their efforts on technological innovation, investment in physical and human capital, as well as controlling population growth, African countries must follow a parallel policy agenda of improving the quality of their institutions. In addition, these policies should focus on the institutional qualities that affect economic growth most such as rule of law, government effectiveness, regulatory quality, political instability, and voice and accountability (the former two turned out to be essential for economic growth in continent). This implies that adopting market-friendly policies, providing an effective judiciary system, making contracts enforceable by law, building political stability, providing effective government service, and strengthening civil liberty and political rights should be the major policy agendas of these countries. Findings from regression analysis revealed that corruption does not influence economic growth. This at best suggests that African countries can set aside control of corruption, at least in the short run.

Technical inefficiency is not the only channel through which bad governance may translate into poor economic performance. Other possible channels such as investment, human capital formation, policy effectiveness, level of integration to the global economy, and so on are yet to be traced. Even if political variables — voice and accountability and political stability — and the rule of law are not related to technical efficiency, they are influencing growth in the continent, probably through other transmission channels. Tracing these channels can be one area of focus for future research.

The growth regression results are based on standard neoclassical growth models. Yet, there is no consensus on whether African growth can be explained by the same fundamental variables as elsewhere in the world. This model/variable uncertainty is another area open for future research.

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[29] The DIF-GMM uses lagged values of differenced regressors as instruments. In addition to this, the SYS-GMM uses the difference of each regressor as an instrument for the level variables.
[30] Bond, Hoeffler, and Temple, "GMM Estimation of Empirical Growth Models."
[31] Enrollment in secondary schools, population growth, and sometimes investment enter with the wrong sign in some of the regressions and are insignificant in some others.
[32] Solow, "A Contribution to the Theory of Economic Growth"; Mankiw et al., "A Contribution to the Empirics of Economic Growth"; Hoeffler, "The Augmented Solow Model and the African Growth Debate"; Nkurunziza and Bates, "Political Institution and Economic Growth in Africa."
[33] We need to be cautious while interpreting the coefficient of lagged real GDP per capita. The convergence hypothesis is based on the following growth equation $y_{i,t} - y_{i,t-1} = \alpha + \beta y_{i,t-1} + \Omega I_{i,t} + \gamma x_{i,t} + u_{i,t} + v_{i,t}$, where the dependent variable is growth of real GDP per capita. However, this equation can be rewritten such that the dependent variable is real GDP per capita $y_{i,t} = \alpha + \beta^* y_{i,t-1} + \Omega I_{i,t} + \gamma x_{i,t} + u_{i,t} + v_{i,t}$ (, the model estimated in this study, where $\beta^* = 1 + \beta$)). In such cases the convergence coefficient is given by $(1 - \beta^*)$. The coefficient of the lagged real GDP per capita from our regression analysis is positive (but less than one) and significant.
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[37] This table summarizes the results from twenty-four regression analyses using stata9 and an extension (an "ado file") developed by D. Roodman ("How to Do xtabond2: An Introduction to 'Difference' and 'System' GMM in Stata." Center for Global Development, Harvard University, 2006) that enables us to estimate systems GMM using stata9 command xtabond2. The first column shows a list of explanatory variables, which include the standard variables used in the original Solow model and its augmented version and indicators of governance quality. Columns 2-5 present the results (coefficient and the standard error) from the original Solow model using difference and system GMM estimation technique. Columns 6-9 present the results from Augmented Solow model.

[38] Kaufmann, et al., "Governance Matters V."

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[48] The production is represented by a constant returns-to-scale Cobb-Douglas production function for its simplicity. J.R. Moroney ("The Relative Efficiency of Market and Planned Economies," *Southern Economic Journal* 63(4): 1084-1093, 1997) argues that at aggregate level, constant returns-to-scale is virtually compelling. Hence, at aggregate level, the simple Cobb-Douglas is preferable as translog production function need not be homogeneous nor homothetic.

[49] However, failure to reject the null would imply that the variance of inefficiency is zero and hence the deviation from the frontier is better represented as fixed effects — the explanatory variable in the inefficiency equation should be included in the production function (Meon and Weill, "Does Better Governance Foster Efficiency?").

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