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Institutions and Economic Growth in Sub-Saharan African Countries: A Panel Data Analysis

BY

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List of Acronyms

ADF	Augmented Dickey Fuller
FDI	Foreign Direct Investment
GDPP	Gross Domestic Product per capita
GDP	Gross Domestic Product
GMM	Generalized Method of Moment
IMF	International Monetary Fund
MIGI	MOIBRAHIM Governance Index
NIE	New Institutional Economist
OECD	Organization of Economic Cooperation for Development
OLS	Ordinary Least Squares
RSS	Residual Sum of Squares
SSA	Sub-Saharan Africa
SYS-GMM	System Generalized Method of Moments
TFP	Total Factor Productivity
VIF	Variance Inflation Factor

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Abstract

Using panel data of forty Sub-Saharan African countries spanning over two decades this thesis analyzes the effect of institutions on economic growth in these countries. For this, the study used institutional index constructed by Freedom House. Consistent with most recent empirical works, the study found that institutions have significant direct impact on growth over the time under consideration. Furthermore, institutions have indirect impact on growth through other factors such as foreign direct investment (FDI) flow to SSA countries. It was found that improvement in institutions has highly significant effect on the FDI inflow. Overall, improving institutional environment has significant impact on economic growth in SSA countries. The causality between institution and economic growth was found to be a bidirectional one. Other factors such as fixed capital formation, population growth and government consumption expenditure were found to have significant effect on SSA economic growth, as expected a priori. Openness to international trade, life expectancy, labor force growth and public expenditure on education were found to have no statistically significant effect on economic growth in SSA countries.

1. INTRODUCTION

1.1. Background

The African continent is rich in natural resources and it contains over half a billion population (Rodrick, 1997). However, the majority of its population did not benefit much from its natural wealth. This is partly attributed to the fact that some of the political leaders divert these wealth for personal use as done by Mubutu of Zaire; some of the leaders are stick to the political possession, while others doing very well to their society like the leader of Botswana. Africa is often known for its slow growth and widespread of poverty, but recently it has shown increasing growth trend[1]. Among the 20 poorest countries in the world, 16 are Sub-Saharan African countries. In terms of GDP per capita and growth rate, the SSA region is among the slowest of any regions in the world (see e.g., Easterly and Levine, 1995).

In economic growth literature the factors for SSA's underperformance ranges from macroeconomic variables to the poor performance of its political and economic institutions including the quality of political leaders. Among others, African state and institutions are very weak as compared to other developing countries; the formal political institutions are so young and most countries lack a tradition of mass political participation; and the political regimes are characterized by authoritarian structures in which the interest of majority cannot be taken into account within a pluralist regime and still the issue of democracy is a national agenda in most part of African countries (Olukashi 2001; Malik, 2002; Ndulu and Connell, 1999).

[1] see Rodrick 1997 and Heinrich 2008

African states are very weak as compared to any other developing countries. Rice and Patrick (2008), defined weak states as countries that lack the essential capacity (i.e. institutional capacity) or lack to fulfill four set of critical governmental responsibilities: fostering an environment conducive for sustainable and equitable economic growth; establishing and maintaining legitimacy, transparent and accountable political institutions; securing their population from violent conflict and controlling their territory and meeting the basic human needs of their population.

Based on this, Rice and Patrick (2008) ranked 141 developing countries according to their performance and found that more than half the world weakest states are Sub-Saharan African countries, of which Somalia is the first weakest state in their ranking. Recently after the September 11, 2001 attacks in US, the US and other Western countries have understood that the weakest states around the world deserve special attention because they believe that those weak states are the breeding ground for transnational security threats. On this basis, currently these countries spend large capital on weak states to strengthen the institutions of the weak states (Rice and Patrick, 2008; Kondo, 2005).

Institutions play an important role in economic development and in growth processes. New institutional economists such as North (1995) consider the role of institutions as market enhancing. As predicted by the neoclassical economists, institutions make economic environment more conducive and enable the market to function very well. As a constraint it also restricts the activities of states to the provision of necessary public goods to minimize rent seeking and government failure.

In this connection, this thesis focuses on institutional factor and examines its impact on economic growth of SSA countries. In most of empirical growth literature the proximate cause of growth (i.e. factors that are included in growth theories) fails to adequately explain economic growth in most of developing countries in general and SSA countries in particular. Thus, studying the fundamental factors is important to understand economic growth of countries like Sub-Saharan African. In the words of Acemoglu (2008), "if part of our study of economic growth is motivated by improving the growth performance of certain nation and living standards of their citizen, understanding fundamental sources of growth is central to this objective". Focusing on the institutional qualities does not mean that the other factors included in growth theories are unimportant in explaining economic growth of SSA countries. So, the specified empirical model considers these factors as well.

1.2. Statement of the Problem

Africa lagged behind the world in many respects and its growth rate has been very low for a long time and as a result, poverty has also been widespread. The reasons range from different policy variables to the institutional qualities. For example, Rodrick (1997) found that the long-term growth performance within Africa is determined by a number of fundamentals: human resources, fiscal policy, demography and a conditional convergence factors. Easterly and Levine (1995) emphasize African poor performance is strongly associated with low schooling, political instability, underdeveloped financial systems, distorted foreign exchange market, high government deficits, low infrastructure, ethnic fractionalization and spillovers from neighbors. Others such as Sachs and Warner (1997) and Dollar and Levine (2005) associate the slow growth of Africa with poor performance of different macroeconomic policy variables like openness to international trade, average annual inflation, national saving rates, and relatively slow accumulation of capital, low productivity and demographic character (such as pressure from higher population growth rate).

Thus one can be forced to ask why SSA countries accumulate low capital (both physical and human) than the other nations.

Why African polices perform poorly? Why labor is less productive? These need to focus around the fundamental determinants of growth like institutions quality, integration and geographical variables. All these fundamental variables are correlated with economic growth, thus understanding the poor performance of the Sub-Saharan African countries need to deal with different socio-political factors besides proximate cause of economic growth. Vast empirical literature relate both the success and failure of economic performance of developing countries with quality of political leaders, qualities of institutions including both political and economic, which partly explain their underdevelopment (see e.g., Snowdorn and Vane 2005; Acemoglu 2008; Easterly and Levine 1995; Rodrick, 2002).

There are common views among economists regarding institutions as an important determinant of economic growth and growth difference across countries, but they have different views on the importance of institutions relative to other factors for Sub-Saharan African countries. The first category of economists give institutions prior factor that explain economic growth, while others refute the supremacy of institutions over the other factors. In this connection, Sachs et al. (2004, 2005), Sachs (2002) and Gunalanch and Hartmann (2007) reject the hypothesis of supremacy of institutions for Sub-Saharan countries by arguing that governance level in African continent was not worse than other countries at comparable level of per capita income. Even after controlling for governance the continent performs poorly and they conclude that Africa has other specific

developmental problem and it needs a big push[2] in its major service sector to come out of poverty trap.

However, others found that measure of institutional quality was first-order determinant of economic growth in developing countries. For example, Acemoglu et al. (2000) found that in the former colonies, including those in Africa, institutional differences explain three-quarter income per capita difference across these countries. Even after controlling for institutional effect, African countries did not show lower income. Cooray (2008), Easterly (2006), Bates and Nukurnziza (2003), Kaufmann and Kraay (2003) and Decker and Lim (2008) also support the supremacy of institutions by pooling data from developed and developing countries in their sample and found governance to have strong positive impact on growth and recommend that developing countries need to improve their governance level. Khan (2007) found that there was weak positive relationship between growth and market-enhancing governance in developing countries and concluded that developing countries need other governance dimensions to explain their growth performance.

The second difference of view among economists was regarding the direction of causality between economic growth and institutions. Most previous empirical studies of interrelationships between measure of institutions and economic growth have concentrated on only one aspect and ignored any feedback or bilateral relationships between economic growth and institutional quality. Some of the growing literature stress that institutional quality is the cause than the consequence of economic growth. The proponent of this view stresses that poor institutional quality is itself one of the reasons for some countries to be poor and have low economic growth than others. Kaufmann and Kraay

[2] It includes investment in major sectors like infrastructure, education, transports, and telecommunications. See Sachs et al. 2004, 2005 for detail.

(2003) test this using data from 153 countries using OLS and instrumental variable methods and found growth to have negative impact on the quality of institutions. This happens because of the resistance to change from elite in power even as the economy grows. However, Arndt and Oman (2006), using similar method by including more explanatory variables in the model, found that economic growth has positive impact on governance indicators. Khan (2007), on the other hand, argues that this may arise due to pooling of data from both developed and developing countries which leads to misleading justifications, because developed countries have better governance capability than developing countries. Therefore, if separately investigated, the direction of causality may inconclusive. This study attempts to respond to these debates using only sub-Saharan African countries based on a premise that institutional quality is one of the factors that determine economic growth of country and difference in economic performance among countries. This study particularly investigates the dynamic relationship between institutional quality and economic growth in SSA countries and attempts to estimate the causality between the two focusing only on SSA countries.

1.3. Objective of the Study

The main objective of the study is to explain the poor performance of Sub-Saharan African countries' economic growth. The specific objectives of the study were:

1. to explain the institutional influence on the growth process of Sub-Saharan African countries;
2. to explain other factors that determine economic growth in Sub-Saharan African countries; and
3. to determine the direction of causality between economic growth and institutional qualities.

1.4. Significance of the Study

Governance has become a developmental agenda for all nations of the world, to multinational companies who want to invest their resources overseas and to international financial institutions (such as World Bank and IMF), which lend a large amount of money for development projects. This study would give better understanding on how institutional quality (governance) affects economic growth and also feedback from growth to institutions. Based on the results, it would also draw some policy implications for possible consideration by policy makers of the countries included in the study.

1.5. Scope of the Study

This study covers the relationship between governance (institutional qualities) and growth in Sub-Saharan African countries during the period of 1987-2006 due to the limited availability of data for institutional quality data. The most widely used indicators for this variable is only available since 1972. Although growth is a problem to all developing countries, it is more serious in the African continent, and therefore the study focuses only on SSA.

2. REVIEW OF RELATED LITERATURE

2.1. Theoretical Literature

In most of economics literature, economic growth, defined as increase in income per capita, is the primary macroeconomic objective of every country. It is a mechanism by which the well-being of society has been uplifted. For SSA countries, where poverty has been its prime identification, economic growth may serve as a means to solve its fundamental problems. But most of SSA countries have faced difficulty to achieve economic growth for successive decades, with exception in recent past (see Rodrick, 1997; Easterly and Leven, 1995; Ndulu and Connell, 1999).

Economic growth has long history in the economics discipline. However, the discussion in modern growth theories is a recent phenomenon. For example, Elias (1992) explained that many countries have experienced a significant level of economic growth only since the beginning of the nineteenth century and after 1950 many countries have registered strong and rapid economic growth, i.e., doubling their GDP per capita income in a very short period of time. In growth literature, the issues of modern economic growth have been associated with the emergence of industrial revolution. In 18th and 19th centuries, economic growth had been largely confined to a small number of countries such as the Great Britain. Gradually modern economic growth spread from its origin to other countries, following European expansion. Since the time of industrial revolution, some countries grew rapidly than others, which led to growth variation across countries and time (Snowdon and Vane, 2005 and Hoist, 2006). Income per capita in countries such as USA, Germany and Japan exceeded those such as Bangladesh and Zaire by a factor of twenty or more[3]. According to Hoist (2006), the ratio of average per capita income of developed nations to developing countries is 10:1

[3] Romer, (1996, p. 5); Kaufmann, (2003); Snowdon and Vane (2005); Hoist (2006)

or 11:1 before World War II and increased to 15:1 in the late 1980s. In 1987 the highest per capita income among the developed countries was recorded for Switzerland at more than US$26,000. Among the developing countries, there were several in Africa and Asia for which per capita income of well under US$200 was recorded (Hoist, 2006).

Thus, the investigation of growth is important not only for understanding the growth process but also to the analysis of the sources of cross-country income differences. That is, we need to understand why such differences occur among those countries and the factors that contribute to these dispersions. Researchers on the field develop theories, models and use data to search for answers that are related to growth questions such as cross-country income differences and growth factors. However, the empirical results and theoretical predications are still quite mixed.

2.1.1. A Glimpse on Neoclassical and New Growth Theories

Most of growth analysis started in the neoclassical growth model of Solow (1956), which is based on Cobb-Douglas aggregate production function that relates output to capital input, labor input and a state of technology as in equation (1).

$$Y_t = K_t^{\alpha}(A_t L_t)^{1-\alpha}, \qquad 0 < \alpha < 1 \tag{1}$$

where Y is output, K is physical capital, L is labor input and A is the level of technology.

The marginal conditions of the production function in (1) are:

$$mpk = \partial Y_t / \partial K_t > 0 \ , \quad mpl = \partial Y_t / \partial L_t > 0 \ \text{ and } \ \partial mpk / \partial k < 0, \ \partial mpl / \partial l < 0$$

where *mpk* and *mpl* are marginal products of capital and labor, respectively. The marginal conditions show that labor and capital exhibit diminishing returns.

The Solow growth model assumes closed economy with perfect competition in the market but ignores the public sector. Furthermore, technical progress, population growth and saving rates were assumed to be exogenously determined in the model. Using these proximate causes of growth it analyzes the growth process and variation of growth across countries and predicts convergence among nations. The model predicts that a country that has higher saving rate should have higher level of income per capita and that has higher population growth should have lower level of income per capita. Technological progress, which is exogenously given, is considered as the driving force of growth in this model. The long-run growth only depends on technological progress and growth from other factors is only temporary. The model also predicts income variation across countries. As explained in Romer (1996), it identifies two possible sources of variation, i.e., either over time or across part of the world in output per worker. This looks into differences in capital per worker and difference in effectiveness of labor. However, the only difference in effective unit of labor leads to permanent growth in output per worker.

The other important prediction of the Solow model is the *convergence hypothesis*, in which countries that have equal steady state parameter, i.e., population growth rate, rate of depreciation, saving rate, rate of technological change and technological level should converge in their economic growth (Valdase, 1999). Though some of the model's predictions were consistent with empirical data and compatible with some of stylized facts of growth, some did not tally with the facts. Mankiw et al. (1992) argue that the relationship among variables are stronger than the prediction of Solow model and they further argue that the model did not account for important features of cross country

income differences observed today. They strongly argue that cross countries income variations and growth are more consistent with the standard Solow growth model after the inclusions of human capital in the model. As a result, they developed human capital augmented neoclassical production function which takes the form in equation (2):

$$Y_t = K^{\alpha}{}_t H^{\beta}{}_t (A_t L_t)^{1-\alpha-\beta} \qquad (2)$$

where "H" is human capital and the other variables are as defined earlier.

In this model, it is assumed that $\alpha + \beta < 1$ implies that there is decreasing returns to capital, where α is the share of physical capital in income and β the share of human capital in income. Human capital augmented neoclassical growth model shows how real per capita GDP depends on human capital, physical capital, state of technology and population growth rate. Among these proximate causes of growth, both physical and human capitals have positive effect on growth while population pressure has negative consequence on economic growth.

Empirically Mankiw et al. (1992) tested augmented Solow growth model and found that the model accounts for 80% of cross-country income variation and they concluded that augmented Solow model provides a complete explanation of why some countries are richer than others. In human capital-augmented neoclassical growth model the steady state growth of per capita income depends on the rate of human capital investment besides other steady state parameters that are already included in equation (1) of Solow growth model.

Unlike the neoclassical growth model the New (endogenous) growth models assume growth as endogenous outcome of economic system. It incorporates technological progress as a product of economic activities and also assumes knowledge and technology are characterized by increasing returns to scale. In endogenous growth model, accumulation of knowledge, which ranges from greater scientific abstraction to the simple one, with its nonrivalry and excludability features, is considered as the driving force of economic growth (Romer 1996).

Furthermore, the New growth model stresses the importance of economic institutions for economic growth by providing incentives to encourage people to invest in both physical and human capital and also creating conducive environment for invention and innovations. By so doing it accelerates the accumulation of knowledge. Similar to the Solow model, the growth rate of income per capita is directly affected by the rate of saving in the economy. It also predicts that the country that has higher population growth rate and rate of deprecation of stock of capital grow more slowly in per capita terms. The other important prediction of the New growth model is that economic integration will raise growth of integrated economic space permanently but this is transitory in neoclassical growth model (Valdase, 1999).

However, the New growth model does not predict cross-country convergence, while neoclassical growth model predicts that countries with equal steady state parameters converge to their common steady state. Regardless of the convergence prediction by the neoclassical growth theories, the gap between developed and developing nations increased over time even within developing countries themselves. Vast empirical literature shows that there has been a growing divergence in living standards across countries. Countries in SSA have failed to attain their own steady state per capita income they had before four decade ago (Ndulu and Connell, 1999).

Yet, no one is certain that this may last long or Lucas prediction may happen. Lucas (2000) proposed, "*...sooner or later everyone enjoys the industrial revolution that all economy will grow at the rate common to the wealthiest economies and the percentage difference in income levels will disappear. The restoration of inter-society income equality will be one of the major economic events of the century to come...*"

Both neoclassical and New growth models explain the difference in living standard and economic growth across countries by using proximate causes of growth (such as labor force, population growth rate, capital accumulation, saving rate, human capital and technological progress). Therefore, to understand these differences we need to go beyond this proximate cause and look for fundamental sources of growth. In order to answer questions such as why some countries accumulate more human and physical capital than others, why technology differences occur across nations, and why some countries are more effective and productive than others, the emphasis should be given to the deeper determinants of growth such as geography, openness and institutional qualities after the prominent works of Krugman (1998), North (1995), Rodrick (1997, 2002) and Sachs and Warner (1997).

Although the endogenous growth theories provide explanation which was absent in the neoclassical growth theories, they are not without shortcomings. Among others, they do not provide any explanation for convergence hypothesis and its prediction. In this respect, the neoclassical growth theories are even better. Even if the assumptions of neoclassical models are questioned by the wave of the New growth theories, there is still good ground to use them for growth analyses. For instance, most recent empirical works are inspired by the use of neoclassical growth model by extending it to include other determinants (e.g., Barro, 1991; Bates and Nkurunziza, 2003; Olson et al, 1998 and

Connell and Ndulu 2000). This thesis is based on this framework of growth with some extensions to include other fundamental causes of growth such as indicators of institutional qualities, openness to international trade and public sector in the model.

2.1.2. Politicization of Neoclassical Growth Model

Both neoclassical and New growth models focused on the proximate causes of growth and they keep aside the fundamental determinants of growth from the models. However, politicization of neoclassical growth model was the first advance in this area to incorporate institutional quality in neoclassical growth model. As indicated in Hibbs (2001), the theory emphasizes the stock of human capital, labor available for production as well as the efficiency with which factor inputs are transformed to output depend decisively on politics, policy and institutional arrangement that affect the security of property right, innovation and investments.

The politicized neoclassical growth model made a greater contribution on methodological ground. Using these methodologies a lot of empirical works have been done. Based on this, they try to link economic growth and institution through total factor productivity (Solow residuals). To start with, the contribution of capital and labor to growth is given by neoclassical aggregate production function:

$$Y_t = (K_t, A_t L_t) \qquad (3)$$

where Y is output K is capital input, L is labor input and A is technology parameter. Following growth accounting decomposition method, the contribution of each of these factors for economic growth was decomposed as follows. Differentiating equation (3) with respect to time yields:

$$\dot{Y}_t = \partial Y_t / \partial K_t \, \dot{K} + \partial Y_t / \partial L_t \, \dot{L} + \partial Y_t / \partial A_t \, \dot{A} \qquad (4)$$

where, $\dot{Y}_t = \partial Y_t / \partial t$, $\dot{L}_t = \partial L_t / \partial t$

$\dot{k}_t = \partial K_t / \partial t$ and $\dot{A}_t = \partial A_t / \partial t$

Dividing both sides of equation (4) by Y_t and re-arranging gives

$$\begin{aligned} \dot{Y}_t / Y_t &= (K_t / Y_t \, \partial Y_t / \partial K_t) \dot{K}_t / K_t + (L_t / Y_t \, \partial Y_t / \partial L_t) \dot{L}_t / L_t + \\ &\quad + (A_t / Y_t \, \partial Y_t / \partial A_t) \dot{A}_t / A_t \\ &= \ell_{kt} \dot{K}_t / K_t + \ell_{lt} \dot{L}_t / L_t + \ell_{At} \dot{A}_t / A_t \end{aligned} \qquad (5)$$

where ℓ_{kt}, ℓ_{lt} and ℓ_{At} are elasticities of output with respect to capital, labor and technology respectively. Again, rewriting the last line of equation (5) yields,

$$= \ell_{kt} \dot{K}_t / K_t + \ell_{lt} \dot{L}_t / L_t + \gamma_t \qquad (6)$$

where $\gamma_t = \ell_{At} \dot{A}_t / A_t$

Subtracting $\dot{L}_t/L_t$ from both sides and assuming constant returns to scale $\ell_{kt} + \ell_{lt} = 1$ the growth of output per worker is given as

$$\dot{Y}_t/Y_t - \dot{L}_t/L_t = \ell_{kt}(\dot{K}_t/K_t - \dot{L}_t/L_t) + \gamma_t \qquad (7)$$

where γ_t is known as Solow residual.

Such decomposition of growth can help to understand how much each factor contributes to output growth. It divides the growth of output into two parts: output growth that results from inputs (labor and capital) and technological progress. The interest here is on the contribution of technological progress which is represented by γ_t term in equation (7). In this equation, whatever left after the contribution of capital and labor is explained is attributed to technological progress. In most economic growth literature A is considered as the level of technology or as total factor productivity. For example, Solow (1956) considered A as anything that enhances labor productivity.

Total factor productivity (TFP) can be determined by a number of factors such as education and skill, quality of infrastructure, openness to international trade, institutional qualities, cultural attitudes and political stability (Romer 1996 and Valdes 1999). Thus, in the politicization of neoclassical growth model TFP is a function of these factors and it measures their contribution for growth through TFP. It has been assumed further that TFP residual could be subdivided into country-specific productivity effect and the random effect, i.e.,

$$\gamma_t = \rho + \xi_t \qquad (8)$$

where ρ country specific productivity effect and ξ_t is random effect and considered as the error term. In equation (8) the country-specific productivity component, ρ is the channel through which institutions and political factors affect economic growth. Substituting γ_t in equation (8) can yield

$$\dot{Y}_t/Y_t - \dot{L}_t/L_t = \rho + \ell_{kt}(\dot{K}_t/K_t - \dot{L}_t/L_t) + \xi_t \qquad (9)$$

The country-specific productivity effect is obtained as a residual from estimation of equation (9). Then in the next stage this factor is analyzed using its determinants (such as institutional, policy and political variables).

Recently some empirical works based on growth accounting methods tried to assess the institutional influence on the economic growth (e.g., Olson et al., 1998 and Connell and Ndulu, 2000). If one is interested in decomposing output growth, this methodology is recommended in growth literature. However, the other alternative approach is to use a regression model that simply relates growth to policy outcomes using a model that sufficiently accounts for most of the influence on factor accumulation as well as on total factor productivity. This approach is much more recommended as it helps to identify the contribution of different influence on growth (Temple, 1999). Thus, this study adopts growth regression approach to account for the variables of interest and see their effect on economic growth.

2.1.3. Economic Performance and the Role of Institutions

Recently there is a general consensus on the importance of institutions for growth and consider it as one of the fundamental determents of economic growth and growth variation across countries. However, there is no common definition for institutions and there is also a continuous disagreement of views among scholars with regard to which specific institutions are important to different economic system. North (1995: p.23), one of the prominent proponents of New Institutional Economics (NIE), defines institutions as follows:

"*...Institutions are rules of the game of the society or more formally are humanly devised constraints that structure human interactions. They are formal rules, common laws, regulations or they are informal like norms of behaviors and self imposed code of conduct and the enforcement of both...*"

The implication of the NIE is that institutions are a framework in which various economic activities are undertaken by the interaction of economic participants. Furthermore, North points out that the mixture of both formal and informal institutions and their enforcement characteristics determine economic performance. Institutions play an important role in economic development and growth. North (1995) and his followers consider the role of institutions as market-enhancing. Accordingly, institutions, by making economic environment more conducive, enable the market to function well, as predicted by the neoclassical economists.

The other prominent economist in NIE, Williamson (2000), indicates that in social analysis institutions are divided into four levels. The first one is embeddedness level and it includes *informal institutions* like customs, traditions, norms and religion. He also emphasized that in this level religion plays a greater role in the society. Most new institutional economists consider institutions at this

level as given. The second one is *institutional environment,* which includes formal institutions like constitutions, laws and property rights, which are again first-order choices to the economy. In the third level, he considered *institution of governance,* which are considered as play of the game, such as contracts, that determine and reshape incentives in the economy. The last level is associated with *agency theory*, and institutions at this level concerned with resource allocations and employment. According to Williamson (2000), among these NIE is mainly concerned with institutional environment and institution of governance. These are important in examining development of nation, for making intertemporal comparisons within a nation and across nations.

Rodrik (1999) also points out five types of institutions that allow the market to perform adequately: (1) *property right institutions* that give an individual incentive to invest and accumulate in the economy; (2) *regulatory institutions* that regulate market when the market fails to do so; (3) *institutions for macro stabilization* which include fiscal and monetary institutions that perform stabilizing function; (4) *institutions of social insurance* that insure society against the social risks; and (5) *institutions of conflict management* that manage conflict that arise due to diverse interests especially in ethnically diverse societies. These include institutions such as rule of law, high quality judiciary, representative political institutions, free election and social insurance.

Economic institutions provide individuals incentive to invest in technology, human and physical capital thereby affecting economic performance of a given country. Institutional economic theory predicts that societies with economic institutions that facilitate and encourage factor accumulation and innovation should prosper relative to societies that do not have such institutions. The *institutions hypothesis* also suggests that those societies that have good institutions are prosperous today and tend to be prosperous in the future. In developing countries, states do too much in the economy thereby

create unproductive rent-seeking activities and crowding out of productive market. Thus, institutions can guide the activities of states in the provision of necessary public goods to minimize rent-seeking and government failure (Bates, 1995; North, 1995; khan, 1995; Acemoglu, 2008; Acemoglu et al., 2002).

Recently western countries, donors and international development assistance organizations (like World Bank, UN and IMF) gave more emphasis to the institutional quality in developing countries. For several years these organizations spend huge amount of money (in the form of aid and loan) on various developmental programs in developing countries. However, most of those programs did not provide satisfactory result in most of developing countries (Kondo, 2005). World Bank research team (e.g., Dollar and Levine, 2005) made an assessment on various project and concluded that aid ineffectiveness in developing countries were associated with poor institutional qualities besides their poor policy. Then onward the World Bank emphasizes that constructing good institutions is prior to any other planning activities. Thus, currently the World Bank has started country-by-country study and gave greater financial support to those developing countries to improve their institutional qualities.

Furthermore, terrorist attack against US on September 11, 2001 was another important factor that attracted the attention of the Western world to developing countries. US and other western countries recognize that the weakest states around the world deserve special attention because they believe that those states are the breeding ground for transnational security threats (Rice and Patrick, 2008; Kondo, 2005). Rice and Patrick (2008) defined weak states as countries that lack to fulfill four set of critical governmental responsibilities: (i) fostering an environment conducive to sustainable and equitable economic growth; (ii) establishing and maintaining legitimacy, transparent and

accountable political institutions; (iii) securing their population from violent conflict and controlling their territory; and (iv) meeting the basic human needs of their populations. Based on this, Rice and Patrick ranked 141 developing countries according to their performance. Among those countries more than half the world weakest states are in SSA countries, Somalia being the first weakest state in their rank. Overall, African states are very week as compared to any other developing countries. Based on this, currently these countries spend large capital to strengthen the institutions of these weakest states (Rice and Patrick, 2008).

After the development of new institutional economics theory the empirical works exploded to investigate the impact of this factor on growth and their contribution for income difference across countries. Acemoglu et al. (2000, 2002), Rodrick, (2002), Kaufmann and Kraay (2003), Dollar and Kraay (2002), Arndt and Oman (2006), Barro (1991), Hall and Jones (1998), Knack (2002) and Sachs (2003) are few of these studies. Although, this is an advance in the area, still much more to do in the words of Williamson:

"...there is unfinished business refinement, extensions, new applications, more good ideas, more empirical testing and more fully formal theory. ...The new institutional economics is the little engine that could. Its best days lie ahead. Who could ask for more?"

2.2. Empirical Literature

2.2.1. Debates and Empirical Results on the Importance of Institutions

Economists in general agree that institutional quality is one of the critical factors explaining the divergence in performance across countries. However, there are different views among economists

in terms of the importance of institutions relative to other factors especially for the developing countries. Some economists consider institutions as prime factor that explain growth in developing countries, while others emphasize that other factors need greater attention in countries such as those in SSA. However, Sachs et al. (2004), (2005) and Sachs (2003) do not accept the explanation on Africa that poor economic growth has emanated from its poor governance. They argue that Africa's governance indicators (as a measure of institutional quality) are not systematically worse than those of other countries at comparable levels of income per capita. They found that even after controlling for governance, the SSA countries perform poorly. They concluded that more policies on governance reform by themselves are not sufficient to overcome its poverty trap and the problem of growth. To help the entire region to escape from these needs deliberate, evidence-based, and cooperative international effort and big push in major sectors of the economy. This argument is also supported by Gundlach and Hartmann (2007) who found statistically and economically significant coefficients of the measures of governance quality (using Kaufmann governance indicators). In their findings SSA countries on average appear to have statistically significantly lower GDP per worker than the other sample countries, even if the quality of their institutions is controlled for. Thus, the poor performance of SSA is explained by continent-specific characteristics, and they reject the supremacy of institutions hypothesis like that of Sachs et al. (2004, 2005).

In sharp contrast to these conclusions, Acemoglu et al. (2002) found that in the former colonies, including Africa, institutional difference explains three-quarters of income per capita difference across these countries. Even after controlling for institutional effect, SSA countries do not show lower income. Easterly (2006) uses three widely used measures of government quality, i.e., measure of democracy, the Freedom House measure of political liberties and Economic Freedom, to assess its impact on growth and found that all measures of government quality are strongly significant

predictors of growth over the estimated time. That is, growth increases with more income at low economic freedom, but decreases slightly at high economic freedom. This result was also consistent with Barro (1996), who found that the relationship between democracy and economic growth is nonlinear in that at lower level democracy improves economic growth but after certain optimal level it decreases economic growth.

Decker & Lim (2008) also stresses the primary importance of institutions as determinant of growth. An institution, as measured by governance, exerts a positive and significant effect on growth. The economic freedom variable has a significant impact on the level of income, whereas the political institution of democracy is insignificant. They concluded that developing countries have to focus on improving the quality of political-economic institutions which exert a more direct influence on economy through the functioning of market processes. Khan (2007) and Meisel and Aoudia (2007) found very weak positive relationship between the quality of governance and economic growth. The failure of any policy in developing countries is the failure of the country to address the necessary governance requirements that would be required to accelerate growth and achieve more rapid development. Thus, developing countries have to work more in improving institutional quality to get rid of its developmental problems.

Cooray (2008) examines the effects of government quality on economic growth in 51 developing and transition economies including some SSA countries and found positive correlation between the quality of government (as measured by governance) and economic growth. Overall results indicate that good governance can improve growth outcomes in developing countries.

Using a sample of SSA countries and institutional data from World Bank, Heinrich (2008) found that institutional quality has significant influence on growth. Similarly, using MoIbrahim composite governance index (MIGI) it was found that economic performance showed positive association with governance but disaggregate measures show mixed result. In SSA, the rule of law and freedom of expression constrain GDP per capita growth while the effects of human rights and economic development are positive.

2.2.2. Causality between Institutions and Economic Growth

Most previous empirical studies (e.g. Sachs,2003; Gundlach and Hartmann, 2007; Heinrich, 2008; and Cooray, 2008) of interrelationships between measure of institutions and economic growth have concentrated on only one aspect and ignored any feedback or bilateral relationships between economic growth and institutional quality. Some of the growing literature stresses that institutional quality is the cause rather than the consequence of economic growth. The proponents of this view stresses that poor institutional quality is itself one of the reasons that some countries are poor and have low economic growth. For example, Kaufmann and Kraay (2003) test this using data from 153 countries using OLS and instrumental variable methods and found that growth has no positive impact on the quality of institutions. They concluded that this happen because of the resistance to change from elite on the power even as the economy grows.

However, Arndt and Oman (2006), using similar method and by including more explanatory variables in the specification, found that economic growth has positive impact on governance indicators. However, Khan (2007) argues that this may arise due to pooling of data from both developed and developing countries, which leads to misleading justifications because developed

countries have better governance capability than developing countries. Thus, if separately investigated the direction of causality may be inconclusive.

Farr et al. (1998) investigate bilateral relationship between economic freedom and economic growth and found significant bilateral feedback between these variables. That is, the two variables are endogenously related. Gardillo and Arce (2003) also found that economic freedom have a significant impact on the growth while no statistically significant causality works from economic growth to economic freedom.

Overall the causality that runs from growth to institutions has less empirical support as compared to the causality that runs from institutional quality to economic growth. In this line, this study dynamically models and investigates the relationship between economic growth and institutional measures using SSA countries to see if there exists any causal relationship between these variables using panel Granger causality test procedure.

2.2.3. Sources of Slow Growth in Sub-Saharan African Countries

SSA countries are characterized by widespread of poverty and slow growth rate with the exception of the recent past. In growth literature the factors for its underperformance ranges from macro economic variables to the poor performance of its political and economic institutions including the quality of political leaders. Easterly and Levine (1995) argue that Africa's economic history since 1960 fits the classical definition of tragedy, with unfulfilled potentials, instability, poorly developed financial systems, and large disastrous consequences. These performances were strongly associated with low schooling, political instability, under-developed financial systems, distorted foreign exchange market, high government deficits, low infrastructure, ethnic fractionalization and spillovers

from neighbors. Sachs and Warner (1997) also explain that Africa has performed worse on different economic policy variables: openness to international trade, average annual inflation, and national saving rates. Most of SSA countries are also landlocked; large fraction of their land area falls in tropical latitudes; there exist high dependence on natural resources, greater ethno-linguistic fractionalization and short life expectancy.

However, Rodrick (1997) differs from this view. When the sample is restricted to only SSA countries, most of the variables used by Sachs and Warner (1997) and Easterly and Levine (1995) become insignificant. This may arise due to pooling of data for large samples from developing countries. By increasing the sample size to 31 SSA countries and re-specifying the model, Rodrick (1997) found that the fundamentals for long-term growth in these countries are human resources, physical infrastructure, macroeconomic stability, and the rule of law. He argues that governments that undertake investments in these areas are rewarded with increased rates of economic growth.

In addition to these, African weak political and economic institutions and ethnic fragmentation also exert pressure on the growth process in the continent. Africa is the most ethnically diverse continent in the world and this resulted in social unrest and conflict among ethnic groups for political positions and resources. Most of conflict that has happened in the continent target the productive sectors of the economy which affect growth process of the continent (Alemayehu and Befekadu, 2005; Olukashi, 2001; Alence, 2004; Sankore, 2000). Malike (2002) and Easterly and Levine (1995) also emphasize that in ethnically diverse societies there is difficulty in agreeing on public policies such as provision of infrastructure, education and health. Empirically, Easterly and Levine (1995) showed that ethnic diversity negatively affects Africa's economic growth. This variable accounts for about 35 percent of African growth differential with the rest of the world.

Furthermore, African political institutions are very weak as compared to other developing countries. Most countries lack a tradition of mass political participation and the political regimes are often characterized by authoritarian structures. In some nations multiparty election had been held but manipulated by the elites in the power. The interest of majority cannot be accommodated within a pluralist regime. African leaders are, in most of the cases, corrupt, driven by their own interest. This may affect the interest of the majority of their population and undermine growth and development of institutions. Still the issue of democracy is a national agenda in most part of African countries (Olukashi, 2001; Malik, 2002; Ndulu and Connell, 1999; Acemoglu, 2008 and Collier and Gunning, 1999).

Thus, African developmental problems are multidimensional; its poor performance can be explained by a plenty of macroeconomic variables. In addition, institutional qualities are also equally important in explaining the growth of SSA countries. That is why this study attempts to model the dynamic relationship between economic growth and institutional qualities and to estimate the direction of causality between the two variables using Granger (1969) causality test.

3. RESEARCH METHODOLOGY

3.1. Data Sources and Sampling

The study uses secondary data for which institutional qualities are proxied by governance index as constructed by different institutions. Data for institutional qualities is obtained from Freedom House, where a country's annual score is available since the first survey conducted in 1972. Institutional index constructed by Freedom House was used as a measure of institutional quality. The data is annually reported in two series: one is political liberty and the other is civil liberty. Both are measured as scale ranging between 1 and 7, 1 being the highest civil liberty or political right while 7 is the lowest value. So, the increase in the numeric value of the index implies deterioration of the institutional index. To avoid confusion, the index is re-scaled and the new index ranges from 0 to 1. Countries with 0 values show the lowest while 1 shows the highest value of institutional index.

Using the Freedom House dataset the reconstructed institutional index, as noted above, ranges from 0 to 1, and we used the index as an arithmetic mean of political liberty and civil liberty. Political liberty explains the situation in which citizens participate in a political process of a country, like participation of different political parties in political process, free election, competitive and corruption free while civil liberty refers to freedom of speech, freedom of religion, association and freedom of press(Arndt and Oma, 2006). Society who feels freedom in those respect motivated to invest in human capital and physical capital and posses business, thus institution can positively influence growth. The other variables are taken from World Bank's World development Indicators 2008 data set (CD-ROM).

This study focuses on the relationship between growth and institutions in Sub-Saharan African countries. Forty Sub-Saharan African countries are selected (see the appendix 2). Most of previous related empirical works pooled the large sample that include both developing countries and developed countries while others focused on large developing countries, which has diverse institutional base, geographical locations and different socio–economic factors. Although doing this has its own advantage with regard to number of sample and performance comparisons among those nations, focusing on only particular subgroups such as SSA countries which have certain common socio-economic characteristics still with diverging heterogeneity among these countries are also informative. Therefore, this study focuses on only SSA subsample which includes only 40 cross-sections, the number was also limited by data availability. Although missing data is a common problem in SSA countries, some countries are worse than others, thus the study does not incorporate such samples to avoid loss of observations.

3.2. Model Specification and Estimation Techniques

3.2.1. Theoretical Framework

This study is based on the human capital augmented neoclassical model which was developed by Mankiw et al. (1992). Thus, the aggregate production function in such model is given as:

$$Y_t = K^{\alpha}{}_t H_t^{\beta} [A_t L_t]^{1-\alpha-\beta} \qquad (10)$$

where Y is output, K is physical capital, L is labor input, A is level of technology, and H is human capital. Furthermore, the model assumes that $\alpha + \beta < 1$, implying that there is decreasing returns to overall capital, where α is the share of physical capital in total income and β is the share of human

capital in total income. Expressing the production function in terms of effective unit of labor, it can be represented as.

$$\bar{y}_t = \bar{k}_t^{\alpha} \bar{h}_t^{\beta} \text{ where } \bar{y}_t = Y_t / A_t L_t, \ \bar{k}_t = K_t / A_t L_t \text{ and } \bar{h}_t = H_t / A_t L_t \tag{11}$$

The model further assumes that labor force and technology exhibit an exponential growth patterns. Thus the population grows at n rate and technology improves at g rate. Therefore the effective unit of labor $A_t L_t$ should grow at (g+n) rate. Moreover, most of related literature (e.g., Valdes, 1999) assumes that both physical and human capital stock depreciates annually at the same δ rate. This study also assumes similarly. In the economy, the fraction of output invested in both physical and human capital denoted as s_k and s_h respectively and their evolution in the economy is given as:

$$\begin{aligned} \dot{\bar{k}}_t &= \frac{d\bar{k}}{dt} = s_k \bar{y}_t - (n+g+\delta)\bar{k}_t \\ \dot{\bar{h}}_t &= \frac{d\bar{k}}{dt} = s_h \bar{y}_t - (n+g+\delta)\bar{h}_t \end{aligned} \tag{12}$$

The steady-state value of human and physical capital is found by solving equation (12) as:

$$\begin{aligned} \bar{k}^* &= \left(s_k^{1-\beta} s_h^{\beta} / n+g+\delta \right)^{1/1-\alpha-\beta} \\ \bar{h}^* &= \left(s_k^{\alpha} s_h^{1-\alpha} / n+g+\delta \right)^{1/1-\alpha-\beta} \end{aligned} \tag{13}$$

Then substituting equation (13) into the production function (10) and transforming it into natural logarithms and taking into account the assumption that $\delta_h = \delta_k = \delta$ (i.e. human capital and physical capital depreciate at the same rate) gives us the steady-state level of per capita income as follows.

$$\ln\left[\dot{y}_t\right] = \ln A_t + (\alpha/1-\alpha-\beta)\ln(s_k) + (\beta/1-\alpha-\beta)\ln(s_h) - (\alpha+\beta/1-\alpha-\beta)\ln(n+g+\delta) \quad (14)$$

Equation (14) implies that the natural logarithms of output per worker depend on exogenous state of technology, the natural logarithms of investment physical capital and investment in human capital and log of labor force growth rate n plus common rate of technological change g and depreciation of capital.

In the above equation, the initial level of technology $\ln A_{t,0}$ is unobserved and therefore it can be captured by the error term, i.e., $\ln A_{t,0} = a + \varepsilon$ where a is constant and ε represents country-specific factors. Thus substituting this into equation (14) gives

$$\ln\left[\dot{y}_t\right] = a + (\alpha/1-\alpha-\beta)\ln(s_k) + (\beta/1-\alpha-\beta)\ln(s_h) - (\alpha+\beta/1-\alpha-\beta)\ln(n+g+\delta) + \varepsilon \quad (15)$$

In most of related studies (e.g., Betes and Nkuruziza, 2003; Mankiw et al., 1992) conducted so far, $g+\delta$ is taken to be 0.05. Therefore, this convention is also considered here. The other variables in equation (15) are proxied as follows: physical capital is proxied by investment to GDP ratio, life expectancy and public educational expenditure were used as proxies for human capital while n is

population growth rate or labor force growth rate which is augmented by 0.05 used as proxy for last term.

This model predicts that components of capital (both human and physical capital) directly affect growth rate while the coefficient on population growth rate has mixed result. Those who based on Malthus' population theory argue that population has negative influence on growth of the economy but other arguments based on Keynesian theory advocates the positive impact of population growth rate on the economy. Thus, in this study a specific direction of influence was not expected a priori. However, if n is taken as the rate of labor force growth, it is expected to have direct impact on economic growth rate; That is,

$$\partial y_t/\partial s_k > 0, \partial y_t/\partial s_h > 0, \quad \partial y_t/\partial n < / > 0 \text{ and } \partial y_t/\partial n > 0$$

3.2.2. Empirical Model

The empirical estimable model was specified based on the theoretical framework developed so far. To start with, in equation (15) the unobservable component of the technological variable was thrown into the error term. However, taking out this variable from the error term and substituting it with its determinate variables such as institutional qualities (INS), openness to international trade (OPN) and government policy (GOV) was the major interest in this study.

It is assumed that a country more open to trade would transfer more technological know-how and various types of knowledge to the economy, and this in turn would improve technological progress, thereby economy growth. A country that has better institutional quality is expected to have better

protection of property rights and law enforcement capacity. This can attract foreign direct investment, through which knowledge would be transferred, thereby affecting the growth rate of the economy (Barro and Sala-i-Martin 1995; Romer, 1996; Valdes, 1999).

A country which lacks support to the private sector and/or to the foreign investor, for example through taxation, may impede technological diffusion and adoption. This government influence is captured by government policy (GOV), which is a proxy by government consumption expenditure. In related empirical work, for example, Connell and Ndulu (2000) assume that government consumption expenditure is financed by tax and this suggestion is also considered in this study. Based on the above explanations, the initial level of technology approximated by its determinate and adding it to equation (15) gives the estimable equation as follows.

$$y_t = B_0 + B_1 \ln(s_k)_t + B_2 \ln(s_h)_t + B_3 \ln(n+0.05)_t + B_4 \ln OPN_t + B_5 \ln INS_t + \\ + B_6 \ln GOV_t + \varepsilon_t \qquad (16)$$

where $(\alpha/1-\alpha-\beta) = B_1$, $(\beta/1-\alpha-\beta) = B_2$, $(\alpha+\beta/1-\alpha-\beta) = B_3$ and $B_0 = a$

The above equation can be written for i^{th} country at time "t" as

$$y_{it} = B_0 + B_1 \ln(INV)_{i,t} + B_2 \ln(LIF)_{i,t} + B_3 \ln(N)_{i,t} + B_4 \ln(OPN)_{i,t} + B_5 \ln(INS)_{i,t} + B_6 \ln(GOV)_{i,t} + \varepsilon_{i,t} \quad (17)^4$$

Specifying equation (17) in the panel data context will yield,

$$y_{i,t} = B_0 + B_1 \ln(INV)_{,it} + B_2 \ln(LIF)_{i,t} + B_3 \ln(N)_{i,t} + B_4 \ln(OPN)_{i,t} + B_5 \ln(INS)_{i,t} + B_6 \ln(GOV)_{i,t} + \eta_i + \varepsilon_{i,t} \quad (18)$$

Equation (18) implies that the log of per capita income is a function of investment in physical capital, human capital, population growth or labor force growth, openness to international trade, measure of institutional qualities and government consumption expenditure. η_i is country specific effect, which varies across countries and $\varepsilon_{i,t}$ is normally distributed random disturbance terms. To interpret the estimated coefficients in terms of elasticity, the variables of the model are expressed in their natural logarithms. Representing all explanatory variables by a vector X, the dynamic growth model that includes lagged dependent variable as regressor is given by:

$$y_{i,t} = \delta y_{i,t-1} + BX_{i,t} + \eta_i + \varepsilon_{i,t} \quad (19)$$

where i=1.....40 t=2....20

[4] In the equation INV refers to investment to GDP ratio, LIF stands for life expectancy, N=n+0.05 labor force growth rate or population growth rate which is augmented by0.05, OPN represent opens to international trade INS refers institutional index and GOV represent government consumption expenditure.

3.2.3. Estimation Technique

Most previous cross-section based growth studies have many shortcomings in the way they handle country-specific effects and endogenous problem of the fundamental determinants of growth like institutional quality. With the existence of endogenous and country-specific effect, OLS methods of estimation would result in inconsistent and biased estimates (Baltagi, 1988; Blundell and Bond, 1998). The estimation methods using dynamic panel models can handle the problems that one can face in cross-sectional growth studies such as omitted-variable bias, endogenous and measurement error problems. Thus GMM approach can handle the above problems by first transforming the standard growth regression that contains country-specific characteristics through first differencing and eliminating the country-specific effect and appropriate instruments (external or internal to the model) can be used to handle endogeneity problem[5].

However, in particular situations the GMM which takes first difference to eliminate country-specific effects and use lagged instruments to correct for simultaneity in the first differenced equation would also be unsatisfactory. This arises due to weak instruments that result in large downward finite-sample biases[6]. Consider a simple autoregressive model of the form:

$$y_{i,t} = \delta y_{i,t-1} + \eta_i + \varepsilon_{i,t} \qquad \text{i= 1....N, t=2,.....,T} \qquad (20)$$

If the observations are independent across individual i, the error term should satisfy

$$E(\eta_i) = 0, \quad E(\varepsilon_{i,t}) = 0 \text{ and } E(\eta_i \varepsilon_{i,t}) = 0 \quad \text{i=1.....N, t=2,.....,T}$$

[5] The First difference GMM suggested by Arellano and Bond (1991).

[6] Blundell and Bond, (1998) , see also Bond, et al. (2001) showed how this method is not good result in the Empirical growth

$$E(\varepsilon_{it}\varepsilon_{is}) = 0 \qquad \forall t \neq s \text{ for i=1,.....,N}$$

and the initial condition is given by

$$E(y_{i1}\varepsilon_{it}) = 0 \qquad \text{i=1,.....,N and} \quad \text{t=2,.....,T} \tag{21}$$

These conditions together imply the following moment restriction, which is sufficient to identify and estimate δ

$$E(y_{i,t-s}\Delta\varepsilon_{it}) = 0 \text{ for t=3,....,T and } s \geq 2 \tag{22}$$

where, $\Delta\varepsilon_{it} = \varepsilon_{i,t} - \varepsilon_{i,t-1}$

These moment restrictions exploited by the linear first difference GMM estimators imply the use of lagged levels dated t-2 and earlier as instruments for the equations for the first difference. Later, Blundell and Bond (1998) argue that the instruments in standard first differenced GMM estimator become less informative in two important cases: first when the value of δ increases towards unity and secondly when the variance of η_i increases. The later occurs when the lagged level of the series is weakly correlated with the subsequent first-differences which make the available instruments weak.

Thus, Blundell and Bond (1998) and Arellano and Bover (1995) propose additional restriction on the initial condition which allows exploiting additional moment conditions for the level equation in GMM framework, the additional assumption is given by:

$$E(\eta_i \Delta y_{i,2}) = 0 \quad \text{for i=1,.....,N}$$

and the other moment condition is given as

$$E(\varepsilon_{it} \Delta y_{i,t-1}) = 0 \quad \text{i=1,.....,N and t=3,.....,T} \tag{23}$$

This allows the use of lagged first difference of the series as instrument for level equation. Therefore, the Blundell and Bond (1998) and Arellano and Bover (1995) estimators combines the system of equations that contain the level equations with lagged first difference as instruments and first differenced equations with lagged levels as instruments. Thus, with the existence endogenous regressor the first order autoregressive model becomes:

$$y_{i,t} = \delta y_{i,t-1} + BX_{i,t} + \eta_i + \varepsilon_{i,t} \qquad \text{i= 1....N, t=2,.....,T} \tag{24}$$

For this study the, vector X encompasses proximate causes of growth and our variable of interest i.e. institutions. Assuming X_{it} and η_i are correlated and endogenous implies that $E(X_{it}\varepsilon_{is}) \neq 0$ i=1,.....,N and $s \leq t$. In taking first difference of the equation (24) to eliminate the individual effect, the additional moment condition would be:

$$E(X_{i,t-s} \Delta \varepsilon_{it}) = 0 \quad \text{t=3,.....,N and} \quad s \geq 2 \tag{25}$$

Thus, lagged value of endogenous variables dated t-2 and earlier can used as instruments for the equation for the first difference. Furthermore, if it is assumed that the first difference of X is uncorrelated with individual specific effect, i.e.,

$E(\eta_i \Delta X_{it}) = 0$ for i=1,……,N and t=2,……,T

Thus, the following moment conditions are available

$E(\Delta X_{i,t-1} \varepsilon_{it}) = 0$ for i=1,……,N and t=3,……,T (26)

In this case, lagged first difference of endogenous variables in the vector X can be used as instruments for the level equation.

3.3. Diagnostic Tests

3.3.1. Unit Root Test

Test for stationary or non-stationary process of individual series is evident in any study that employs time-series data. In the case of panel data, the data has time dimension, thus, recently many studies undertake panel unit root test. Moreover, to avoid spurious regression it is advisable to conduct unit root test for each individual series in the data. The widely used test applied in a number of recent studies include Levin and Lin (1992, 1993), Levin et al. (2002) and Im et al. (2003). The work of Levin and Lin assumes that all individuals in the panel have identical first order partial autocorrelation while all other parameters are permitted to vary across individuals. Their test

procedure is designed to evaluate the null hypothesis that each individual in the panel is non-stationary against the alternative hypothesis that all individuals are stationary.

Alternatively, Im et al. (2003) proposes an alternative testing procedure by relaxing the restrictive assumption of Levin and Lin by allowing heterogeneity on the coefficient on the first order. They propose based on average individual unit root test statistics for panel data. Particularly, their test is based on the average of Augmented Dickey-Fuller (ADF) statistic computed for each group in the panel. Since their test allows for heterogeneity among individuals, this gives their test superior power performance as compared to Levin and Lin. Therefore, in this study the test procedure by Im et al. (2003) was used to test unit root for each individual series as specified below.

Suppose that the stochastic process Y_{it} is generated by the first-order autoregressive process

$$Y_{it} = (1-\phi_i)\mu_i + \phi_i Y_{i,t-1} + \varepsilon_{it} \quad , \text{i=1...N, t= 1....T} \tag{27}$$

The null hypothesis of unit root to be tested is given as $\phi_i = 1$ subtracting $Y_{i,t-1}$ for all i in (27) can yield,

$$\Delta Y_{it} = \alpha_{ii} + \beta_i Y_{i,t-1} + \varepsilon_{it} \tag{28}$$

where $\alpha_i = (1-\phi_i)\mu_i, \beta_i = -(1-\phi_i)$ and $\Delta Y_{it} = Y_i - Y_{i,t-1}$ the null hypothesis of unit root becomes $H_0 : \beta_i = 0$ for all i against a the alternative $H_1 : \beta_i < 0$,i=N_1 +1, N_1 +2,....., N.

The IPS test statistics is given as

$$\bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_{iT}$$

IPS assumes that t_{iT} is i.i.d. and has finite mean and variance and the test statistic is given as:

$$t_{IPS} = \frac{\sqrt{N}(\bar{t} - \frac{1}{N}\sum_{i=1}^{N} E[t_{iT} \mid \beta_i = 0])}{\sqrt{\frac{1}{N}\sum_{i=1}^{N} \text{var}[t_{iT} \mid \beta_i = 0]}} \sim \text{N (0, 1)} \quad \text{as } T \to \infty \text{ followed by } N \to \infty \text{ sequentially.}$$

The IPS provides simulated critical vales for different number of N and T.

3.3.2. Panel Co-integration Test

If some (all) variables of the variables in the model are non-stationary, then there could be some long run relationship among the variables. To check this, co-integration test are required. The most popular test is the test developed by Pedroni (1999) it allows one to investigate the heterogeneity in the panel data in which heterogeneous slope coefficients, fixed effect and individual trend specific are allowed. Thus, this study is based on this co-integration test. Consider the following co-integration regression:

$$Y_{i,t} = a_i + b_t + \beta_i X_{it} + \ell_{it} \; ; \; \text{i=1.....N,} \qquad \text{t=1.....T} \qquad (29)$$

where N refers to number of individuals in the panel, T is number of observation over time. $Y_{i,t}$ is dependent variable, X_{it} is explanatory variables, b_t is trend of individuals, ℓ_{it} is stationary error

term, a_i is individual fixed effect allowed to vary across countries. The residual of this regression ℓ_{it} is used to construct ADF based group mean panel co-integration test statistics[7]. To test the null hypothesis the residuals obtained from the regression can be used to construct the test statistic by estimating the autoregressive model for the residuals as,

$$\ell_{it} = \delta_i \ell_{i,t-1} + \sum_{k=1}^{K} \delta_{i,k} \Delta \ell_{i,t-k} + \upsilon_{it}$$

Based on this, Pedroni developed seven statistics (see Pedroni, 1999 table I for mathematical explanation). For all test statistics the null of no co-integration is implemented as a residual-based test against two alternative hypotheses: the first one assumes homogeneous autoregressive residual parameter for all cross-sections which Pedroni terms within-dimension test and the second with heterogeneous alternative which Pedroni calls between-dimension test or group statistic test. The null hypothesis of no co-integration can be specified as,

$H_0 : \delta_i = 1 \ \forall i$ against the alternative

$H_1 : (\delta_i = \delta) < 1$ Or

$H_1 : \delta_i < 1 \ \forall i$

Due to the presence of conflicting results provided by each of these statistics Pedroni showed panel ADF statistics and group ADF statistics generally perform better, followed by panel variance ratio statistics. The asymptotic distribution of each of these statistics is expressed as:

[7] See for details pedroni (1999)

$$\frac{\aleph_{N,T} - \mu\sqrt{N}}{\sqrt{I}} \sim N(0, 1),$$

where $\aleph_{N,T}$ is appropriately standardized (with the dimension of N and T); μ and I are adjusted mean and variance terms, respectively and their values are tabulated and reported in table I and II (see Pedroni, 1999 and 2000). Thus, depending on possible value of μ and I, the calculated value is compared with tabulated value in standard normal distribution.

3.3.3. Granger Causality Test

To determine the causality between institutions and growth, the Granger-based causality test is used. Following Granger (1969), if there are two variables x and y, causality may run from x to y, or x causing y if, after controlling for the information in the past value of y, the past value of x add significantly to the explanation of current y, we can say that x Granger causes y. Similarly, if we control for the information in the past value of x and the past value of y add significantly to the explanation of current x, then we can say that y Granger causes x. If only one of these relationships is true, this indicates unilateral causation. But if both hold, true bilateral causation exists between variables. This approach is employed to test Granger causal relationship between institutions and economic growth (proxied by income per capita). Following the Granger method the causal relationship between institutions and economic growth can be specified dynamically as follows.

Economic growth as a cause for institutional quality ($y \rightarrow INS$) and institutions as a cause for economic growth ($INS \rightarrow y$) are specified in equation (30) and (31) respectively,

$$INS_{i,t} = \sum_{l=1}^{L} \phi_l INS_{i,t-l} + \sum_{m=1}^{M} \varphi_m y_{i,t-m} + \omega_i + \theta_{i,t} \quad (30)$$

$$y_{i,t} = \sum_{j=1}^{J} \gamma_j y_{i,t-j} + \sum_{k=1}^{K} \mu_k INS_{i,t-k} + \tau_i + \upsilon_{i,t} \quad (31)$$

where i =1-------N and t= 1----------T and $y_{i,t}$ is natural logarithm of per capita income, INS_t is measure of institutional quality in a country i over t period. τ_i and ω_i are country-specific effects and $\upsilon_{i,t}$ and $\theta_{i,t}$ are random error terms. J, K, L and M are appropriate lagged values to be chosen and γ, μ, φ *and* ϕ are estimated parameters.

To conduct Granger causality test for the first equation, it is estimated with and without $y_{i,t-m}$. Similarly, the second equation is estimated with and without the $INS_{i,t-k}$ term followed by conducting of F-test for the joint significance of the parameters taking lags. To determine the causality, the null hypothesis was:

$H_0 : \varphi_m = 0$ where m=1.....M

$H_1 : \varphi_m \neq 0$

Similarly the null for the second equation were:

$H_0 : \mu_k = 0$ where, k=1.....K

against the alternative that

$$H_1 : \mu_k \neq 0$$

In the above tests, if one of the two hypotheses are failed to be rejected, the causation is unidirectional. However, if both hypotheses are rejected, then there is feedback and the two variables could be determined endogenously. But if both null hypotheses are failed to be rejected, there could be no causal relationship between growth and institutions.

4. RESULTS AND DISCUSSION

4.1. Diagnostic Results

4.1.1. Results of Panel Unit Root Test

The first task before estimating the regression equations is testing whether the variables are stationary or not. This study used panel unit root test developed by Im Pesaran and Shin (2003), which allows each panel member to have different autoregressive parameter with the null hypothesis that *all countries have a unit root for the variable* against the alternative that *some cross-sections are without unit root.* The result for this test is given in the following tables.

Table 1 shows unit root test result for variables in level based on average ADF statistics reported for each panel members.

Table 1: Panel unit root test result for level variables

Variables in level	With only individual effect		With individual effect and time trend	
	Average ADF	IPS W-stat	Average ADF	IPS W-stat
Ln_GDPP	-0.9792	1.52206 (0.9360)	-1.7877	1.56860 (0.9416)
Ln_INV	-1.2237	0.13938(0.5554))	-1.9767	-0.78275 (0.2169)
Ln_EDU	-1.1401	0.56331 (0.7134)	-1.9259	-0.50392(0.3072)
Ln_N*	-1.4220	-0.86067(0.1947)	-2.4602**	-2.85557 (0.0021)
Ln_OPN	-0.8588	1.94250(0.9740)	-1.7831	0.15244 (0.5606)
Ln_LIEF	-0.9006	1.96480(0.9753)	-1.7544	0.36515(0.6425)
Ln_GOV	-1.3105	-0.28138(0.3892)	-1.8736	-0.25937 (0.3977)
Ln_INS	-1.5545	-1.53760(0.0612)	-2.0632	-1.07464 (0.1413)
Ln_N	-1.9227	-3.59516(0.0002)	-2.0035	-0.86750(0.1928)

Note: The sign *, **and *** denotes significance of variables at 10%, 5% and 1% respectively levels, p-value is given in parenthesis

Following Im Pesaran and Shin (2003), under the null hypothesis that all countries have a unit root for the variables, the larger negative value leads to the rejection of the unit root. Thus the null hypothesis that every country has unit root for natural logarithm of GDP per capita, investment, public education expenditure, institution, labor force growth, life expectancy, government consumption expenditure and openness variables have no strong evidence for rejection of the null that there is unit root. However, for log of augmented population growth rate, the null is rejected at 5%, implying that the variable is stationary at level.

If the variables are not stationary at level, they have to be tested in first difference. Thus, variables are tested for unit root in first difference and results are reported in Table 2.

Table 2: Panel unit root test for differenced variables

Variables in Difference	Result with only individual effect		Result with individual effect and time trend	
	Average ADF	IPS W-stat	Average ADF	IPS W-stat
ΔLn_GDPP	-1.7756	-2.37219 (0.0088)	-2.5029**	-2.95837 (0.0015)
ΔLn_INV	-1.9395	-3.51580(0.0002)	-2.4755**	-2.67370 (0.0000)
ΔLn_EDU	-2.0048	-3.59829 (0.0002)	-2.8691***	-4.21759 (0.0000)
ΔLn_OPN	-1.7877	-2.57379(0.0030)	-2.7659***	-3.95586 (0.0000)
ΔLn_LIEF	-1.7993	-2.85391 (0.0022)	-2.6894***	-3.88737 (0.0001)
ΔLn_GOV	-2.3499*	-5.46823(0.0000)	-2.5895***	-3.00420 (0.0013)
ΔLn_INS	-1.9704	-3.49068 (0.0002)	-2.4466**	-2.50449 (0.0061)
ΔLn_N	-2.6667***	-7.33691 (0.0000)	-2.6162***	-3.31236 (0.0005)

Note: The sign *, **and *** denotes significance at 10%, 5% and 1% levels, p-value also given in parentheses

In this case, the test statistics are negative and significant at even smaller significance level. Therefore, the null hypothesis that there is unit root is rejected for natural logarithms of public education expenditure, life expectancy, government consumption expenditure, openness and labor force growth at 1% level. For natural logarithms of GDP per capita income, investment and institution the null hypothesis is rejected at 5% significant level. This implies that except log of population growth, all other variables were only stationary after first differencing. That is, the natural logarithm of most of level variables are I(1) (i.e., integrated at degree one) but first differences of these variables are I(0).

4.1.2. Result of Panel Co-integration Test

If some variables in the model are non-stationary, then there could be some long-run relationship among the variables. Based on the result from unit root test, both output (GDP per capita) and institutional index are found to be I (1). Therefore, the two variables may have long-run relationship. To check this, co-integration test developed by Pedroni, which is a one-tailed test following normal distribution with critical value of -1.64 was used and large negative values lead to rejection of the null hypothesis for chosen statistics. However, panel variance ratio statistic has positive statistical result and in this case, the null hypothesis is rejected for the higher positive value.

The Pedroni test result is reported in Table 8 in Appendix 3. The test statistics results in co-integration between institutions and economic growth. As shown in the table, both the most powerful test statistic with the value of -2.172081 in the Group ADF-statistics and the value of -3.635740 in panel ADF statistics would allow rejection of the null hypothesis of no co-integration in favor of co-integration. The rejection of the null hypothesis of no co-integration between GDP per

capita and institution implies the existence of co-integration between GDP per capita and institution; i.e. they have long-run relationship.

4.1.3. Results of Granger Causality Test

If the two variables are co-integrated, at least the causality runs in one direction. In this section causality between institutions and economic growth is discussed. Following Granger, the dynamic representation in equations (30) and (31) were estimated by accounting for endogeneity problem using GMM estimation technique. Each of these equations was estimated and important statistics were saved from the result to conduct the F-test, as given in Table 9 and 10 in Appendix 3. The Sum of Squared Residuals for respective lag and degree of freedom for both numerators and denominators, respectively, is given in the tables and the standard F-statistic which measures the joint significance of the parameters was also given in the fourth column of the tables. The result in Table 9 shows the null hypothesis that *institutions do not Granger cause economic growth.* Under both cases (i.e. when the lag length was 1 and 2) with their respective F-statistics of 40.362 and 7.815 the null hypothesis is strongly rejected at 1% level. This indicates that institution Granger causes economic growth as measured by GDP per capita. This result supports the previous finding by Vega-Cardillo and Arce (2003).

Similarly Table 10 (in the appendix) provides the test result for the null hypothesis *economic growth does not Granger cause institution.* Also in this case the null hypothesis is strongly rejected at 5% level by the standard F-test in both cases (i.e. when the lag changes from one to two) with respective F-statistics of 5.934 and 3.904. Thus the rejection of the null implies that economic growth Granger causes institution. Therefore, the results indicate that for SSA country sample there is Granger causal

relationship between the institution and economic growth. It is evident that the causality is running in both directions and the two variables are endogenously determined.

4.1.4. Result of Multicollinearity Test

Before proceeding to estimation and interpretation of the result, it is important to test for multicollinearity among explanatory variables. As documented in most econometrics literature, the presence of multicollinearity results in inflated standard errors, which makes inference from estimation problematic (Maddala, 1992, Gujarati, 2004). Therefore, the test was conducted using variance inflation factor (VIF), which computes test statistics for each explanatory variables and the results are reported in Table 3. A VIF statistic greater than 10 or 1/VIF < 0.10 indicates the presence of serious multicollinearity. Since the VIF statistics for these series were less than 10, serious multicollinearity problem was not identified for all variables.

Table 3: VIF Test for Multicollinearity

variables	VIF	1/VIF	Variables	VIF	1/VIF	variables	VIF	1/VIF
L.ln_GDPP	1.63	0.612121	L.ln_GDPP	1.50	0.665157	L.ln_GDPP	1.56	0.642628
ln_ OPN	1.53	0.652724	ln_ OPN	1.45	0.688937	ln_ OPN	1.46	0.683218
ln_EDU	1.53	0.653589	ln_LIFE	1.12	0.891608	ln_LIFE	1.12	0.894028
L.ln_INS	1.46	0.684704	L.ln_INS	1.33	0.749274	L.ln_INS	1.30	0.767401
ln_INV	1.44	0.692629	ln_INV	1.31	0.760616	ln_INV	1.32	0.755798
ln_GOV	1.36	0.732669	ln_GOV	1.15	0.871876	ln_GOV	1.11	0.904119
ln_N	1.16	0.864129	ln_N	1.12	0.891519	ln_N*	1.20	0.832483
Mean	1.45		Mean	1.28		Mean	1.30	

4.2. Descriptive Statistics

Table 4 shows summary statistics of variables included in estimated models. Thus, each row depicts summary statistics for particular variable. The second row provides GDP per capita in 2000 constant price which is used as a measure of economic performance. The variable has great variation among the cross-section with the maximum value country Equatorial Guinea 8097$ in 2005 and Liberia has the lowest GDP per capita with 56.40$ in 1995.

Table 4: Descriptive Statistics

Variables	Mean	Median	Max	Min	Obs
GDPP	5.991707	5.671456	8.999356	4.033673	790
INV	2.811626	2.876684	4.732489	0.741937	763
LIFE	3.902890	3.895397	4.292791	3.526361	791
EDUC	1.098667	1.134024	2.267451	-0.213137	722
N*	0.929703	1.003009	2.283002	-6.514363	783
OPN	4.080753	4.113503	5.214458	2.722597	659
INS	-1.447420	-1.609438	0.000000	-1.945910	733
N	-2.543980	-2.563206	0.030880	-5.884657	775
GOV	2.611842	2.594884	4.241943	1.051085	766

Note: All variables in the above table are in natural logarithms forms.

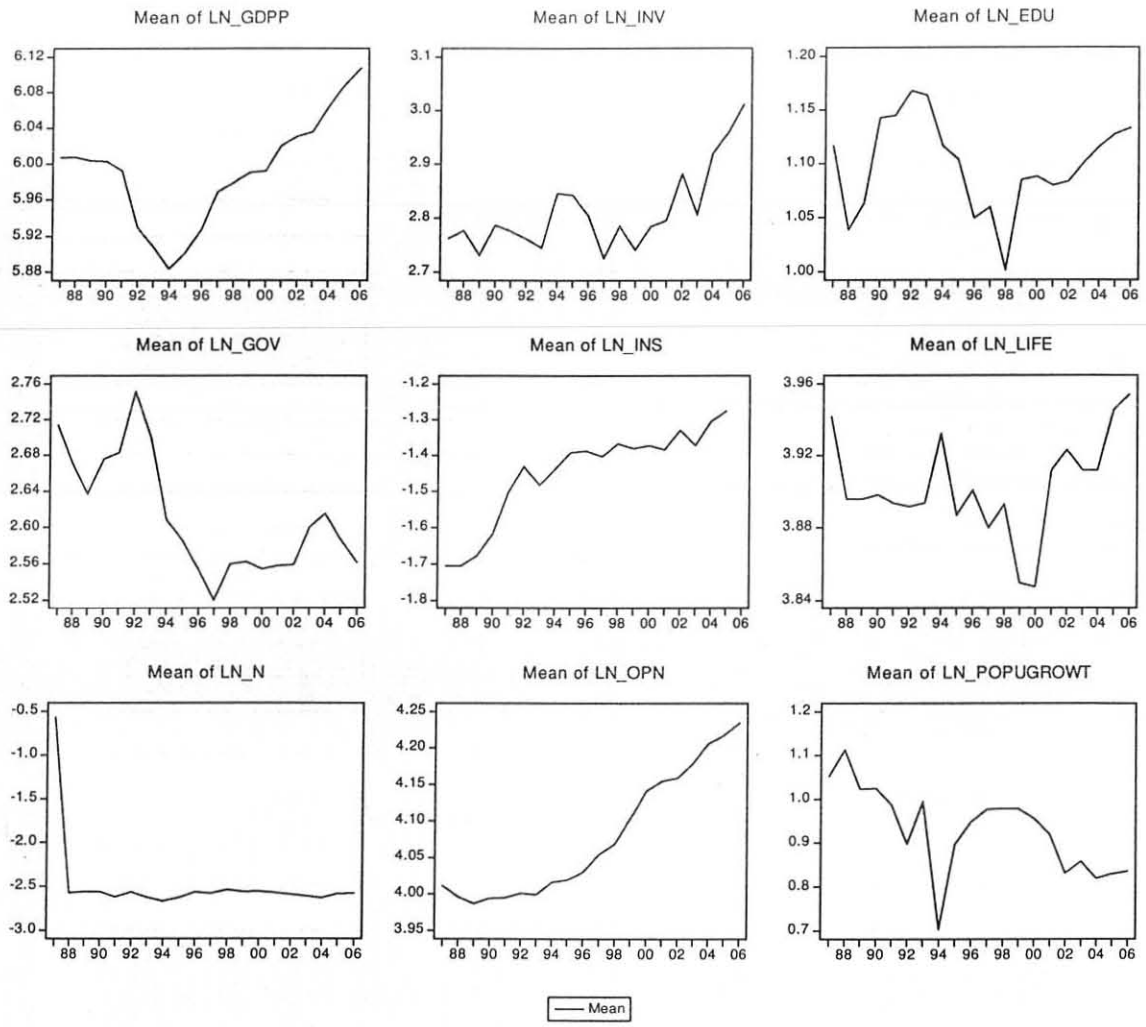
The third row illustrate statistical summary of fixed capital formation for which Equatorial Guinea has the maximum fixed capital formation as percentage of GDP 4.732 (113 percent) in 1996 while Cote-d'lovire has minimum fixed capital formation as percentage of GDP of 0.741 (2.1 percent) in 1998 and the mean for the overall observations is 2.811.

With regard to life expectancy, Mauritius has the highest among the sample countries with 73 years in 2006 and Siera Leone has the lowest life expectancy, i.e., an average person can live for 34 years in 1992, which is far below the SSA average of 49 years. The fifth row depicts public education expenditure as a percentage of GDP for which Namibia has maximum speeding on education with 9.65 percent of its GDP in 1992 but Chad with minimum spending on the education only 0.8 percent of its GDP in 1989. Rwanda has maximum population growth rate in the observation of 9.65 percent in 1998 and Siera Leone with minimum population growth rate score in the observation 0.01 percent per annum in 1994. Openness measured as the ratio of trade volume to GDP, Equatorial Guinea has maximum score of trade to GDP ratio of 183 in 2000, while Congo democratic Republic minimum score of trade to GDP ratio with the value 15.21 in 1994.

Institutional index (INS) score measured as the average of civil liberty and political liberty. Mauritius and Cape-Verde have among the maximum score in the observation with value 1 and Benin has minimum institutional quality score with value of 0.14. With regard to labor force growth rate Comoros has 0.02 growth rate in 2006 and Rwanda with the lowest labor force growth -0.047 in 1994. The last row show government consumption expenditure which includes current government expenditure on goods and service (including compensation on employee) in the sample Eritrea has the maximum government consumption expenditure of 63 percent of its total expenditure in 1999 and Equatorial Guinea with minimum score of 2 percent in 2006.

The general trend of variables is shown in Figure 1. The figures plot the mean values of the data along the vertical axis and time on horizontal axis for each series. As shown in the graphs, the mean values of investment, public education expenditure, government expenditure, population growth and life expectancy (all are in natural logarithm) vary across time in the sample countries. The average of

active labor force growth rate shows steeply downward until 1988 then onward it looks constant for long period of time. The average of GDP income per capita shows downturn before 1994 while it depicts an upward trend since then. Mean of institutional index show an upward trend with little swing after 1992. Openness to international trade generally shows an upward trend since 1989.



Note: population growth is denoted by N* in other part of the study.

Figure 1: Trend of variables across date

4.3. Econometric Results and Discussion

This section presents results of the empirical growth model estimated using the panel data. The total sample is based on 40 SSA countries (list of the countries is in Appendix 2) for the year from 1987 to 2006.

Table 5: Estimation Results

Dependent variable Ln_GDPP per capita.

Explanatory Variables	Estimation Techniques			
	OLS	First difference GMM	SYS-GMM	Fixed Effect(within)
Constant	0.710621 (0.447954)	-	-	5.930159 (0.336111)
Lag Ln_GDPP	0.883137 (0.037664)	0.830590 (0.042908)	0.862408 (0.038774)	0.052044 (0.021490)
Ln_INV	0.043973 (0.011714)	0.037066 (0.011505)	0.030140 (0.011295)	0.064825 (0.031830)
ln_LIFE	0.004397 (0.031736)	0.016761 (0.021325)	0.015832 (0.032045)	-0.017715 (0.030280)
Ln_N	0.022367 (0.053267)	0.016978 (0.068757)	0.026673 (0.051288)	0.027416 (0.043184)
Ln_OPN	0.003133 (0.017422)	0.013546 (0.025853)	0.025291 (0.020827)	0.096837 (0.075063)
Lag Ln_INS	0.023271 (0.009042)	0.041712 (0.022021)	0.023788 (0.013814)	0.052433 (0.026496)
Ln_GOV	-0.022814 (0.008450)	-0.037879 (0.016142)	-0.021613 (0.009514)	-0.082262 (0.041089)
R^2	0.997366	-	-	0.984877
AR(1) p-value	-	0.000	0.000	-
AR(2) p-value	-	0.251	0.073	-
Sargan test P-Value		0.50	0.223	-
Durban-Watson stat	1.917614	-	-	0.217175
No. of countries				

Note: Standard errors are given in parentheses.

Table 5 reports the estimation results of OLS estimators, Arellano and Bond (1991) estimation of first-differencing and Arellano and Bover (1995) and Blander and Bond (1998) estimation result of SYS-GMM. For all regressions, the report includes variables in augmented Solow growth model proxied by different variables, including other regressors (such as openness, institutions and

government consumption expenditure) and the dependent variable is the natural logarithm of GDP per capita used as a proxy for measurement of economic performance.

Although OLS, first-differenced and fixed effect are reported, focus is given to system-GMM results. This is due to the fact that OLS estimators may not be good in particular cases, as well documented in many econometrics literature since the estimators are biased due to the presence of lagged dependent variable; i.e., lagged GDP per capita, as explanatory variable, may be correlated with country fixed effect. It may also be correlated with endogenous variables in the right-hand side of the regression equation (such as investments, opens and institutional variables). This makes the coefficients biased and invalidate the t-statistics for inference (Wooldridge, 2002; 2004; Arellano and Bond, 1991; Roodman, 2006).

However, to avoid this problem it is suggested to estimate the difference GMM developed by Arellano and Bond (1991), which transforms the data by first-differencing to remove country-specific fixed effect from the model but as stated in Hoeffer et al.(2001), and Roodman (2006), this method poorly performs in a particular situation when time-series data are persistent, which is evident in empirical growth models, as output (GDP) is highly persistent. The second solution is instrumental endogenous variables with other variables that are not correlated with fixed effect, suggested by Arellano and Bover (1995) of SYS-GMM. The interpretation of results in Table 5 is based on the preferred system-GMM estimation technique reported in the fourth column.

The SYS-GMM reports coefficients for augmented Solow growth model and other variables of interest. Since the variables are measured in natural logarithm the coefficients can be interpreted as elasticities. The estimated coefficient on lagged dependent variable is highly statistically significant

even at smaller level of significance and shows that a percentage change in the lagged growth would result in 0.86 percentage change in the current economic growth rate. This implies that past economic performance significantly affect current economic performance of the country.

Fixed capital formation to GDP ratio was used as a proxy for physical capital (investment), and the estimated coefficients are shown in column 4 of Table 5. The estimated coefficient of investment is statistically highly significant with expected positive sign, which is consistent with previous empirical findings[8]. It suggests that a country with higher investment to GDP ratio has good ground for economic growth and development by increasing capital labor ratio in the economy as expected by neoclassical and New growth models. Relatively, a percentage change in fixed capital formation would result in 0.03 percentage change in GDP per capita for the period under consideration.

Life expectancy at birth was used as a proxy for human capital in estimation. It is assumed to capture health facility and health policy[9]. The coefficient of the log of life expectancy was statistically insignificant. Similarly, the estimated coefficients of the alternative measure of human capital, i.e. public educational expenditure as percentage of GDP (see column 2 in Table 7 in Appendix 3) was found to be statistically insignificant in system-GMM estimation. Unfortunately both proxies for human capital found insignificant in our data set.

The demographic variable, *labor force growth rate, n,* in the estimation of labor force growth model also showed statistical insignificance in the SYS-GMM estimation. However, the alternative when *n* was taken as population growth (see column 3 in Table 7 in Appendix 3), the estimated coefficient of the

[8] Betes and Nukuruziza, (2003) and Heinrich (2008) Connell and Ndulu (2000) found that investment has significant impact on the economic performance in Africa.

[9] World Bank shows Health spending has less impact on life expectancy in sub-Saharan Africa and the low level of life expectancy in Africa partly due to the consequence of high prevalence of HIV/AIDS.

variable became negative (which is Consistent with the prediction of neoclassical and new growth theories) and statistically significant (-0.017(0.008)) in SYS-GMM estimation, which is consistent with the findings of Betes and Nukurrziza (2003), Sachs (1997) and Connell and Ndulu (2000).One may also relate this to the Malthusian population theory which argues that the rise in population hampers the economy performance of a country.

Trade and finance are the major ways through which Africa is linked with the rest of the world for long time (Alemayehu, 2002). As documented in different works, openness has an important impact on economic growth through promoting competition and efficiency, accumulation of physical and human capital (Alemayehu, 2002, 2004; Sachs and Warner, 1995 and Varela, 2008). However, in Table 5 from system-GMM the estimated coefficient of openness was positive but statistically insignificant for SSA countries. Contrary to the proposition of new growth theory which stress the importance of integration for long run growth and previous empirical findings by Sachs and Warner (1995), this result shows that openness did not affect economic growth in our data.

However, openness has some indirect impact through other growth determinants such as foreign direct investment. Table 11 (in Appendix 3) depicts estimation results of foreign direct investment regressed on institution index, openness, labor force and other determinants. The result was that openness exerts both statistically and economically significant impact on foreign direct investment inflow to a country. In magnitude, a percentage improvement in trade volume would result in 0.97 percentage improvement in FDI inflow. The other factors such as domestic investment and GDP per capita were statistically insignificant. The estimated coefficient of government consumption expenditure was also statistically insignificant.

For institutional index, which was constructed as the average of the two indexes (i.e., average of civil liberty and political liberty) in this study, the estimated coefficient of lagged institutions was found to be positive and statistically significant at 5% level in system-GMM regression. This shows that lagged institutional index (past improvement in institutional) has greater impact on the current economic performance. Consistent with previous empirical findings (for example Rodrick, 1997; Heinrich, 2008; Cooray, 2008 and Easterly, 2006 few among others) institution found positive and significant impact on economic growth of SSA countries in this study.

Furthermore, institution has also indirect effect on growth through FDI. However, the joint presence of institution and FDI as growth determinants became insignificant, as can been in Table 13 (in Appendix 3). However, separately both have significant effect on economic growth (Table 5). Therefore, as shown in Table 11, the estimated coefficient of institution has positive and highly significant effect on FDI even at lower significance level. In magnitude, a percentage improvement in the institutional index would result in 1.1 percentage increase in FDI. Overall improvement in institution, i.e. improvement in political freedom and civil liberty, is good for economic growth in general this is consistent with new growth theories and New institutional economics which assert that good institutional environment promote economic growth. With regard to its impact on domestic investment, the estimated coefficient was statistically insignificant.

Government consumption expenditure measures the expenditure that does not directly increase the productivity of the economy[10]. The estimated effect of government consumption expenditure on growth was found to be negative and statistically significant in SSA sample[11] over the period under

[10]The WDI government consumption to GDP ratio includes all government expenditure on goods and services (including compensation for the employee) excluding of military and educational Expenditure.

consideration. Its relative importance is that a percentage increase in government consumption expenditure to GDP ratio would result in 0.02 percentage decrease in growth over the estimated time.

Since it is assumed that government expenditure is partly financed by tax, increase in government expenditure deteriorates economic growth for it crowds out private investment. To test this, investment ratio was regressed on government consumption expenditure and other explanatory variables and the result was reported in Table 12 (in Appendix 3). However, the estimated coefficient was found to be statistically insignificant, suggesting that there was no crowding out effect of government consumption expenditure.

At the bottom of First-Differenced and SYS-GMM estimation results the value of AR (1), AR (2) and Sargan test are reports for autocorrelation of both first order, second order and Sargan test for over identification restrictions, respectively. The first-order serial autocorrelation test report rejects the null hypothesis of no autocorrelation. However, this statistics i.e. AR (1) is misleading as it always depicts negative and rejects the null hypothesis which indicates the presence of autocorrelation. Thus, relying on it is not informative as suggested by Roodman (2007) and checking the second-order serial correlation is recommended to test presence of autocorrelation. The test result of AR (2) statistics fails to reject the null hypothesis, which proves that there is no autocorrelation. This is evident from the fact that the lagged values of endogenous variables such as investment, openness and institution dated t-2 onward was used as instrument (Roodman, 2006, 2007; Arellano and Bond, 1991; Jung, 2005). However, Roodman (2007) warns practitioners using all available lags as instruments since that may generate problem of too many instruments, which

[11] Connell and Ndulu, (2000) also found similar result in Sub-Saharan sample.

over fit endogenous variables and fail to remove their endogenous component and results in biased estimated coefficients towards un-instrumented estimate.

Following Roodman (2007), to reduce the number of instruments certain lagged instrumental variables were used and the result was reported in Table 6 (in Appendix 3). As shown in the Table 6, when all available lags are used as instruments (see second column), the number of instruments exceeds the number of observations and the coefficients cannot be estimated. When lags are reduced to 10 the numbers of instrumented variables decreases but the number of instrument are still many as compared to the number of observations. This is detected through higher probability of computed Sargan test, which is used to test the validity of instruments or the overidentification restriction. Under the null hypothesis that the overidentification restrictions are valid, the higher computed probability value suggests that the null hypothesis that the set of instrument are valid is not rejected. However, higher probability greater than 0.25 is seen as a suspect for the problem of too many instruments (Roodman, 2007). Thus when the lag order was limited to 10, the Sargan probability would be 0.368, which evidently indicates the problem of too many instruments. Furthermore, when only two lags (i.e. second and third) are used, the probability for Sargan test is dropped to 0.093. As stated in Roodman (2006), very small instrumental count also weakens the Sargan test probability less than 0.1. Intuitively the instrumental count that may generate p-value in between 0.1 and 0.25 may be seen as reducing the problem of too many instruments. Thus, the reported p-value for system-GMM estimation of 0.223 is consistent with the above argument and evidently the instruments used in the estimation are valid.

5. CONCLUSIONS AND POLICY IMPLICATIONS

Most economists agree that institutional quality is one of the critical factors explaining the divergence in economic performance across countries. However, there are different views among economists with the importance of institutions relative to other factors especially for developing countries. Some economists consider institutions as a prime factor explaining growth in developing countries, while others consider it less important.

This thesis analyzes the relationship between institution and economic growth in SSA countries, using institutional index constructed by Freedom House. First, the diagnostic tests such as panel unit root test, co-integration test and variance inflation factor for multicollinearity test were conducted. All variables used in estimation were tested for the presence of unit roots, and except for log of population growth rate, all other variables were not stationary in level, while their first differences were stationary. Having non stationary series, we then turned to test the co-integration between the economic growth and institution. As the result indicates, we rejected the null hypothesis of no co-integration between these variables. Thus, the pedroni statistic supports the existence of long run relationship between economic growth and institutions. Finally the variables were tested for multicollinearity problem using VIF method and the test result showed no problem of multicollinearity. Following these tests, an extended version of augmented Solow growth model, which includes institutional index, openness to international trade and government consumption expenditure, was estimated using System-GMM technique.

The estimation results showed that the institutional measure of political and civil freedom were positively associated with economic performance measured as GDP per capita. It was also found

that lagged values of institutional index had positive and statistically significant effect on economic growth in SSA countries, implying that past improvements in institutional qualities were associated with improvements in economic performance.

Furthermore, it was expected that institution quality would also indirectly affect economic growth through FDI. Accordingly, the institutional quality variable had positive and highly significant effect on FDI. In magnitude, a percentage improvement in the institutional index would result in considerable improvement in FDI. Overall, improvement in institutional quality was found to be good for economic growth in SSA countries. Therefore, these countries have to focus on improving their institutional qualities to reap the indirect benefits of institutions besides its direct effect on economic growth.

The study also found that demographic characteristics, which are measured by population growth rate, exert significance pressure on economic growth of SSA countries. Government consumption expenditure was found to have significant negative effect on economic growth of SSA countries. More population implies more mouths to feed, which may divert private and public resources such as savings towards unproductive activities such as consumption. However, for this the result was not conclusive since the estimated coefficient of investment in population growth was found to be statistically insignificant.

Similarly, the estimated coefficient of government consumption expenditure was found to be statistically insignificant for its test for existence of crowding-out effect hypothesis, showing that the study did not find enough evidence to support the argument that government consumption

expenditure crowds out private investment. Thus, the effect of government consumption expenditure on growth may possibly work through other factors.

Moreover, in this study openness to international trade, life expectancy, labor force growth and public education expenditure were found to have statistically insignificant effect on economic growth of SSA countries. This suggests that these factors would have little or no effect on economic growth and SSA countries have to focus on improving their institutional environment in addition to aligning its population policy to reduce its dampening effect on economic growth.

Finally, most previous empirical studies of interrelationships between measures of institutions and economic growth have concentrated only on one aspect and ignoring any feedback or bilateral relationships between economic growth and institutional quality. In view of this, the result in this thesis showed that causality between institution and economic growth runs bidirectionally. This suggests that improving one would positively affect the other and policies need to recognize this interrelationship in a complementary manner.

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Appendices

Appendix 1: Variable Description and Sample Countries

GDPP	GDP per capita in constant 2000 $
INV	Investment (fixed capital formation as percentage of GDP)
N*	Population growth plus 0.05, i.e. conventionally the sum of depreciation and technological progress taken as 0.05.
EDU	Public educational expenditure which is proxy for the human capital
OPN	Openness, measured as the sum of export and import over GDP where all are in constant 2000 $
GOV	Government consumption expenditure
INS	Institution, measured the average of civil liberty and political liberty
LIFE	Life expectancy at birth
n	Labor force growth rate

Appendix 2: List of Sample Countries

Congo, Dem. Rep	Niger
Congo, Rep.	Nigeria
Coted'Ivoire	Rwanda
Djibouti	Senegal
Equatorial Guinea	Sierra Leone
Eritrea	South Africa
Ethiopia	Sudan
Gabon	Tanzania
Ghana	Togo
Uganda	Zambia
Guinea	Zimbabwe
Guinea-Bissau	Benin
Kenya	Botswana
Liberia	Burkina Faso
Madagascar	Burundi
Malawi	Mali
Mauritius	Mozambique
Namibia	Cameron
Chad	Comoros
Cape- Verde	Central Republic of Africa

Appendix 3: Output Tables

Table 6: SYS-GMM for Different lag order

Variables	Lag (2 .)	Lag (2 10)	lag (2 5)	lag (2 3)
Constant	-	-	-	
Lag Ln_GDPP	-	0.874381 (0.039326)	0.862408 (0.038774)	0.918322 (0.029993)
Ln_INV	-	0.037379 (0.010712)	0.030140 (0.011295)	0.003885 (0.014526)
ln_LIFE	-	0.010990 (0.031099)	0.015832 (0.032045)	0.024426 (0.026956)
Ln_N	-	0.024842 (0.051660)	0.026673 (0.051288)	0.030827 (0.057229)
Ln_ OPN	-	0.017796 (0.016917)	0.025291 (0.020827)	0.059463 (0.031803)
Lag Ln_INS	-	0.021414 (0.010524)	0.023788 (0.013814)	0.008258 (0.019401)
Ln_GOV	-	-0.022668 (0.008929)	-0.021613(0.009514)	-0.027977 (0.011788)
AR(1) p-value	-	0.000	0.000	0.000
AR(2) p-value	-	0.194	0.089	0.082
Sargen test P-Value	-	0.368	0.223	0.092

Note: Standard errors are given in parentheses.

Table 7: Estimations Result for alternative variables

Varibels	SYS- GMM	SYS-GMM
Lag Ln_GDPP	0.877507 (0.044162)	0.881441 (0.029364)
Ln_INV	0.026870 (0.008725)	0.033266 (0.011114)
Ln_EDU	-0.037632 (0.025251)	-
Ln_LIFE	-	0.008056 (0.020229)
Ln_N	0.034247 (0.048324)	-
Ln_N*	-	-0.016935 (0.015181)
Ln_ OPN	0.018865 (0.018017)	0.029082 (0.016630)
Lag Ln_INS	0.031041 (0.012999)	0.027315 (0.009711)
Ln_GOV	-0.021232 (0.008990)	-0.016765 (0.008331)
AR(1) p-value	0.000	0.000
AR(2) p-value	0.348	0.183
Sargen test P-Value	0.0112	0.026

Note: Standard errors are given in parentheses.

Table 8: Pedroni Panel Co- integration

	Sample	Statistic
(within- dimension) Panel ADF- statistic	40 countries	-3.635740 (0.0005)
(Between-dimension) Group ADF-statistic	40 countries	-2.172081 (0.0377)

Note: p-value is given in parenthesis.

Table 9: Granger causality from Institution to GDP per capita

Institution → GDPP

Lag length	Residual sum of square (RSS)	Degree of freedom	F-statistic
Lag2	3.540764		
Without institution	3.623991	(2, 670)	7.815***
Lag1	4.595130		
Without institution	4.857445	(1, 710)	40.369***

Note: ***, **and * indicate significance level at 1%,5% and 10%.

Table 10: Granger causality from GDP per capita to Institution

GDPP → Institution

Lag length	Residual sum of square(RSS)	Degree of freedom	F-statistic
Lag2	11.58536		
Without GDPP	11.65883	(2, 616)	3.904**
Lag1	11.91728		
Without GDPP	12.02579	(1, 655)	5.934**

Note: ***, **and * indicate significance level at 1%,5% and 10%.

Table 11: Estimation Result

Dependent Variable: LN_FDI

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_FDI(-1)	0.378759	0.085731	4.418005	0.0000
LN_GDPP	0.733646	0.608262	1.206135	0.2284
LN_GOV	-0.374735	0.322025	-1.163684	0.2452
LN_INV	0.424485	0.384887	1.102882	0.2707
LN_N	0.830965	0.363306	2.287233	0.0227
LN_OPN	0.975946	0.501480	1.946130	0.0523
LN_INS	1.118694	0.359508	3.111734	0.0020

Effects Specification

Cross-section fixed (orthogonal deviations)

R-squared	0.194065	Mean dependent var	-0.436121
Adjusted R-squared	0.182767	S.D. dependent var	1.373492
S.E. of regression	1.241650	Sum squared resid	659.8453
J-statistic	246.0133	Instrument rank	189.0000

Table 12: Estimation Result

Dependent Variable: LN_INV

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_INV(-1)	0.577352	0.073098	7.898299	0.0000
LN_GOV	-0.016664	0.078196	-0.213108	0.8313
LN_GDPP(-1)	0.149545	0.060404	2.475751	0.0136
LN_INS(-1)	0.055343	0.083791	0.660490	0.5092
@ISPERIOD("1989")	-0.087986	0.044955	-1.957212	0.0508
@ISPERIOD("1990")	-0.014485	0.046865	-0.309067	0.7574
@ISPERIOD("1991")	-0.092788	0.051726	-1.793828	0.0733
@ISPERIOD("1992")	-0.064108	0.057491	-1.115104	0.2652
@ISPERIOD("1993")	-0.100825	0.077676	-1.298027	0.1948
@ISPERIOD("1994")	0.008989	0.060900	0.147604	0.8827
@ISPERIOD("1995")	-0.064517	0.056750	-1.136855	0.2560
@ISPERIOD("1996")	-0.104152	0.062870	-1.656619	0.0981
@ISPERIOD("1997")	-0.161783	0.099276	-1.629633	0.1037
@ISPERIOD("1998")	-0.043415	0.075596	-0.574310	0.5660
@ISPERIOD("1999")	-0.083370	0.066635	-1.251140	0.2114
@ISPERIOD("2000")	-0.076170	0.075975	-1.002563	0.3165
@ISPERIOD("2001")	-0.030730	0.071954	-0.427071	0.6695
@ISPERIOD("2002")	0.015519	0.076164	0.203754	0.8386
@ISPERIOD("2003")	-0.108812	0.082872	-1.313011	0.1897
@ISPERIOD("2004")	0.054489	0.065754	0.828685	0.4076
@ISPERIOD("2005")	0.015794	0.070239	0.224863	0.8222

Effects Specification

Cross-section fixed (orthogonal deviations) Period fixed (dummy variables)

R-squared	0.343202	Mean dependent var	-0.044454
Adjusted R-squared	0.321453	S.D. dependent var	0.301813
S.E. of regression	0.248615	Sum squared resid	37.33288
J-statistic	388.9535	Instrument rank	325.0000

Table 13: Estimation Results

Dependent variable ln_GDPP

Explanatory variables	Estimation techniques	
	SYS-GMM1	SYS-GMM2
LN_GDPP(-1)	0.963967(0.000)	0.950335(0.000)
LN_INV	0.055461(0.000)	0.05524(0.0002)
LN_LIFE	0.017263(0.6067)	0.022953(0.4751)
LN_N	0.030418(0.4780)	0.029337(0.4881)
LN_GOV	-0.043047(0.0033)	-0.037638(0.0097)
LN_FDI	0.002847(0.2510)	0.003958(0.0908)
LN_INS	0.016444(0.1458)	-
Sargen test	0.301	0.0283

Note: p-value is given in parentheses.

Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all source of materials used for the thesis have been duly acknowledged.

The examiners' comments have been dully incorporated.

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