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Institutions and Development: Are Some More Critical Than Others? -A Cross-Section Empirical Analysis of 54 Countries[1].

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Abstract

Strong institutions are often mentioned as the factors that would lift Africa from under-development. But given the resource constraints of African countries, policy makers would have to prioritize which institution or institutions to commit scarce resources to. An aggregative measure of many institutions would not be very useful for their policy decisions, and some questions would still linger. First, what is the relative importance of one institution to another? Second, do institutions exert equal impact on comprehensive development as they do on economic growth? The contribution of this paper is in addressing these two issues. We find that in assessing the importance of institutions on development, it makes a difference whether one addresses economic growth or comprehensive development. Using data from 1985 to 2004, for 54 countries, 32 of them from Sub-Sahara Africa, government effectiveness seems to be the institution whose improvement would have the most overall impact. Its impact on growth and development is strong, but its superiority is in comprehensive development.

I. Introduction

For many years, foreign aid to Africa was geared toward promoting economic growth. Many African countries, in the 1980's underwent wrenching economic strictures in the name of structural adjustments for economic growth. The results were in the main, disappointing[2].

Various economic theories were income and utility based, explaining the relationships between growth in output or income and the productivity of labor and capital. The neo-classical economic growth model assumed a production function with decreasing returns to capital. Solow[3] theorized that a country would

[1] The School of Business Administration, Accounting and Economics, Georgian Court University, Lakewood, New Jersey. I am grateful to the editor of SJI for reviewing and accepting this paper. I am equally grateful to the three anonymous referees, who pointed out many areas of the manuscript that required revision, and pointed me to some other works, Mancur Olson on institutions, for example, which turned out to be very informative. I thank Sue Viscardi of the department who scrupulously went through the document, pointing out references in the document, not properly referenced at the end, and putting the references in the order according to the Journal. I thank my wife, Eunice, and my two daughters, Okwui and Ije, who read the paper over and made numerous spelling and grammar corrections. To the extent this paper has any redeeming quality, the above are responsible. Any errors and shortcomings are mine, and mine alone.

[2] William Easterly and Ross Levine, Africa's Growth Tragedy, A Retrospective, 1960-1989

[3] In Technical Change and Aggregate Production Function (Solow, 1956)

achieve a certain steady-state income/capita, given the growth rates for saving and population. He associated higher saving rate with higher steady state income, and higher population with lower steady-state income. He would infer that the speed of income growth would depend on where a country was, relative to her steady-state income level.

In an augmented Solow model, Mankiw, Romer and Weil would add human capital to Solow's exogenous variables of labor and physical capital, in order to more properly account for both the direction and magnitude of income growth in countries[4]. This theory has served to predict the differences in income growth between countries. More importantly, the various explanations why Africa had not grown as rapidly as other countries of the world were attributed to labor and capital growth and productivity. Mankiw et al went as far as to claim that 80% of cross country variations in income and the differences between the rich and poor nations, could be explained by the augmented Solow model.

The implicit assumption in all this is that, all else, institutions for example, did not matter, or were equally endowed in all countries, developed and developing. It also makes the assumption, it would seem, that a high level of income and income growth rates would equate to elimination of poverty and deprivation for the population. The whole convergence theory does not seem to be borne out by facts (Przeworski and Limongi, 1993). Realities, and many studies of the developing countries, especially in Africa, have shown that one needed to look beyond economic growth and the neo-classical factors of labor and capital.

The quest for other factors were motivated by two developments. One was that some countries of Africa, South America and Middle East had experienced rapid economic growth in the 1970's on account of rapid rise in the price of crude oil. But this, especially in Africa, had not translated into great wealth and much poverty reduction for the masses. In fact, rather than things improving subsequently, they got worse.

The second motivating factor was Amartya Sen's seminal work in 'development as freedom' which changed the paradigm of what constituted comprehensive development as opposed to just economic growth. This thought process must have been re-enforced by economists such as Mancur Olson, who, in an address delivered for him, post-humously, on population growth, contended that per capita income levels could not be explained by changes in labor and capital alone, institutions had to be included. Olson states – " Glances on each side of the meandering rivers, arbitrary lines, or forbidding walls that constitute national borders rarely reveal any vast differences in resources per capita or in human capacities. But the borders, when they mark lines of greatly different per capita incomes, always delineate substantially different institutions and economic policies"[5] On Amartya Sen's contribution to a paradigm change in the economic and development discourse, Polly Wizard, would write—"Sen --- has contributed to a framework in which authoritatively recognized international standards in the

[4] Mankiw et al, "A Contribution to the Empirics of Economic Growth", 1992

[5] Mancur Olson on the Key to Economic Development, a paper Olson had prepared for a population conference in New Delhi, India, in 1998. But he died before it was delivered. Published in Population and Development Review, Vol.24, No.2 (Jun., 1998), pp.369-379

fields of poverty and human rights can be meaningfully conceptualized and coherently understood in economics."[6]

It was these motivations that compelled a look beyond economic growth to comprehensive development (encompassing human rights and freedoms) as the more purposeful measure of development, and inclusion of institutions in the equation.

II. ***Data Definitions, expected relationships with economic growth and infant mortality, and some literature positions***

Of the 54 countries in the study, 32 are from Sub-Sahara Africa, 12 from Western Europe and North America, and 10 from Asia. Our data cover a period of 20 years, from 1985 to 2004. Some of the data, such as GDP and GDP growth, labor force and human capital are complete for all countries. Investment share is not complete. The governance data are available only for the years 1996 through 2004. Data on exports and infant mortality are somewhat sporadic. Many African countries did not have infant mortality data for the years before 2000.

Institutions / Governance Measures Six governance measures (institutions) were derived from the World Bank Papers[7]. The six are described below:
(i) Voice and Accountability (VA) measures the democracy in a country – the extent of political participation, the freedom of speech, and the freedom of the media.

Outside of a number of West European and North American countries, India and Israel, democracy is really not practiced in most of the world, especially in the third world. It is a concept that is talked about – even the military which has taken over governments in Africa so many times, would claim to be practicing democracy. The civilian governments are not much better either. Once a party gets into office, the tendency is for them to try to perpetuate themselves there. Most recent examples are Nigeria and Zimbabwe- with very blatantly rigged elections, not concealed from the rest of the world. How democracy affects economic growth and/or comprehensive development is not clear-cut. Some argue that its effect is positive, and others see no effect at all, or even some negative effects.

Adam Przeworski and Fernando Limongi (1993) contend that they still cannot conclude, at the end of the day, whether democracy fosters growth or not. They point to as many democracies as dictatorships that had experienced rapid rate of economic growth. They also point to the notoriously weak statistical studies in explaining the variance in growth, as well as the tendency for these studies to be specification dependent. They conclude that " – without a good specification of economic model of growth, it is not surprising that the partial effect of politics is difficult to assess. Hence it does not seem to be democracy or authoritarianism per se that makes the difference (*in economic growth*) but something else,--------- what that something else might be is far from clear." Along the same line, John

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[6] Poly Wizard, Case paper 91, "Contributions of Profesor Amartya Sen in the Field of Human Rights"Center for analysis of social exclusion, London School of Economics, January 2005.

[7] The data on Governance were compiled by the team of Kaufmann, Kraay and Mastruzzi for the World Bank – Governance Matters iv and v: Aggregate and Individual Governance Indicators for 1996 – 2005, and 1996- 2002- World Bank Working Paper Series #4012, 2006

Helliwell (1994) finds the partial effect of democracy on growth to be negative and insignificant. He, however, asserts that the negative and insignificant effect would seem to be counterbalanced by the positive effect of democracy, exerted indirectly on growth, through education and investment.

One study that claims to be sure there is a positive relationship is that of David Leblang (1997), who suggests that the inconclusive results are due to faulty research design and / or specification errors by the researchers. Leblang asserts that when one reviewed economic growth over time, not just cross-sectionally (what he calls cross-temporal design) the effect of democracy on growth would be unmistakably positive. Janine Aron (2000) reviews the spectrum of democracy versus growth literature and concludes that: on the positive side, transparency and accountability will enhance economic growth, but on the negative side, the delay introduced in seeking consensus, and interest group lobbies will delay responses to shocks and implementation of legislative mandates, thus reducing growth.

While our findings are mainly of a positive relationship between democracy and growth, our quest is to understand democracy effect relative to other institutions. We find it relatively weak.

(ii) Political Stability and Absence of Violence (PI) measures the likelihood that a sitting government would be thrown out of office by some non-democratic means.

Just like democracy, there seem to be conflicting research findings with respect to whether political stability has a positive relationship to economic growth or comprehensive development, for that matter. Again what has taken place in Africa since the wave of independence in the 1960's, has prompted numerous studies, to determine if the laggard growth was caused by the many coups d'etat, and political assassinations. Mancur Olson (1963) theorizes that economic growth leads to political instability, and that political stability, in the long run, would lead to lower economic growth. An attempt by Arthur Goldsmith (1987) to substantiate Olson's theory with data from the Less Developed Countries from 1958 through 1977, failed to prove the negative relationship. However, Jakob de Hann and Clemens Siermann (1996) find that only in Africa, according to their study, was there a mixed support for the view that political instability reduces economic growth. They find that in Asia, political repression and growth are positively related, even though political instability hampers investment.

Fosu (1992) investigated the impact of political instability (PI) on economic growth, and came to the conclusion that the impact was significant. He argued that PI did not only cause 'brain drain' – the flight of skilled workers to better economic opportunities (human capital reduction), it decreased the willingness of investors to invest and accumulate capital (capital reduction). The reduction in the quantity of capital, physical and human, would seem to reduce output. He had studied a number of Sub-Sahara African countries, using a modified Cobb-Douglas production function. Janine Aron (2000) asserts that when property rights were included in the investment equation, PI ceased to be significant; accordingly, PI in many cases would have no impact on economic growth. The problem with PI is that of endogeneity. Whereas PI could enhance growth, the reverse is also possible. This study finds a mixed impact. In some cases, PI has impact. In other cases, its impact is not noticeable.

(iii) Government Effectiveness (GE) measures the quality of the bureaucracy. It is a measure of the effectiveness of the civil service, and its insulation from political pressures. This is what Evans and Rauch called weberianness – the extent to

which the bureaucratic structure is characterized by meritocratic recruitment, long-term and predictable career systems. This would include infrastructure management, roads, electricity supply, pipe-borne water, and telephone services. It covers efficiency of public expenditures, management of public debt, budget management, effective use of resources, human and materials.

When government is effective, social services are provided, proper medical and educational services reach the entire population, and there is widespread opportunity to escape poverty and degradation. Rauch and Evans find in their study of bureaucracy (weberianness score) that it is not the size of government that is at issue, but the structure of the bureaucracy[8]. The dramatic growth of the East Asian 'Tigers' in the 70's and 80's could be attributed to their bureaucracies. Meritocratic bureaucracy would relate positively to economic growth in spite of its size. Rauch and Evans show a positive relationship between increased weberianness and economic growth. Henderson (July 2003) found equitable and effective bureaucracy instrumental in poverty reduction[9]. One would also expect a negative relationship with infant mortality. This is one institution whose impact on growth has not been controverted by research. Our study lent much support to these findings.

(iv) Regulatory Quality (RQ) measures the extent to which government regulations permitted and promoted private sector development. To what extent would changes in regulations be predictable and easily available to the population? Are tax laws, customs and trade regulations helpful rather than cumbersome to businesses? Are labor relations good or problematic? One would expect a positive relationship with economic growth, and a negative relationship with increases in infant mortality (IM).

(v) Rule of Law (RL) measures the quality of, and confidence in, the judicial system and its law enforcement apparatus. This also addresses the ability of the system to protect the physical well being of individuals and their properties – property rights. It measures the court system, its affordability, fairness, honesty, speed and enforceability of the laws. It speaks to the incidence of organized crimes, street crimes, and the perception of how safe one is in the day, and at night. The higher the rule of law, the better the environment for economic growth would be. Richard Posner (1998) observes that a modest legal infrastructure rather than an elaborate judiciary might be what was needed for developing economies to prosper. The legal system should be able to protect property rights and safety.

Many East Asian economies and China have prospered, even when their countries' judiciaries were quite weak, more than states with very strong judiciary, like India and Great Britain. Vijayaraghavan and Ward (V&W, 2006) investigated the impact of each institution on economic growth, using

[8] Evans and Rauch constructed what they called a weberianness scale, of different bureaucracies, and found that this score, in a growth regression analysis, contributed significantly to growth.

[9] Jeffery Henderson, David Hume, Hossein Jalilian and Richard Philips, writing under the auspices of the British Government Research on Globalization and Poverty, "" Bureaucratic Effects: Weberian State Structures and Poverty Reduction", July 2003, find that "there is indeed a strong relationship between states with effective 'Weberian' public institutions and their ability to reduce poverty"

predominantly African countries, and a mix of other developing countries in Asia and South America. They used four institutions, namely: security of property rights, governance, political freedom, and government consumption. The governance measure was a simple average of corruption, rule of law and bureaucracy.

Using the augmented Solow growth model, in an Ordinary Least Squares (OLS) Regression Analysis, they estimated the impact of these institutions on growth, concluding that the most influential were security and property rights, and government size. Security and property rights were positively related to growth in income. Growth in government consumption was negatively related to income growth. As in most economic literature, looking at institutional impact, V&W resorted to an aggregated measure for governance. One would have difficulty arguing how property rights would exist outside the rule of law. In our study, using the World Bank measure of institutions, rule of law and property rights are inseparable.

(vi) Control of Corruption(CM) addresses the extend to which government would check the use of public power for private gain. One would think that in the African context, the mitigation of corruption would be a 'cure all'. Our study does not support that. Other governance issues seem to have had more impact on development.

Bayley (Dec. 1966) hypothesizes that corruption may not be as bad to development as one would think, demonstrating that corruption could indeed 'wear two hats'. It could play a useful role in transition economies. He argues that corruption plays a role, which would, in its absence, be played by another activity, which might be more detrimental to the economy. Opportunity for corruption, he thinks, may indeed improve the quality of the civil servants, and could result in increased allocation of resources from consumption to investment.

Even though a number of studies have pointed to the benefits of corruption (Nye, 1967), the overwhelming evidence is that corruption is harmful to growth (Bardhan, 1997; Mauro, 1995; Nye, 1967), and harmful to infant mortality[10]. Mauro (1995) was one of the first economists to measure the impact of institutions on growth, using a composite of institutional measures, and concluding that corruption deterred private investment, and consequently was detrimental to economic growth. He also determined that bureaucratic efficiency was, at least, "as important for investment and growth, as political stability". Again he used the impact of aggregated institutional measures. One would expect the reduction of corruption in the economy to be beneficial to growth and to the reduction in infant mortality.

Other independent variables used in the analysis

Initial GDP/Capita (X1) gives the GDP/capita at the beginning of the study period (1985) in constant US dollars (the base year is 2000). If as the Solow model assumed, each country progresses toward a steady state GDP/capita level,

[10] Mauro (1995) finds that corruption reduces private investment in the economy, resulting in reduced growth in national income. JS Nye in Corruption and Political Development: A Cost-Benefit Analysis (1967) enumerates some advantages of corruption as well as some offsetting disadvantages.

richer countries would grow slowly as they reach the steady state. Poorer countries would tend to grow faster, under normal conditions, since their level of GDP would still be far from the steady state. Initial GDP/capita would be negatively related to GDP growth. Our 1985 figure comes from the Penn World Tables[11].

Labor Force Growth(X) refers to increases in the working age population, regardless of whether they are employed or unemployed. There are two ways in which labor force might influence growth. One is the growth of capital/worker, and the other is unemployment. If labor grew without growth in capital investment, there would be a decrease in capital per worker, and a decrease in output per worker. If unemployment increased as labor grew, there would be a negative impact on output. We did not have unemployment figures available for most of the Sub-Sahara African countries. The thinking is that unemployment is unusually high in these countries anyway. Increases in labor force would have a negative impact on economic growth, and would generate increases in infant mortality. This seems to be what our study showed, with labor's negative regression coefficients. Our data for the labor force came from the World Bank Development data.[12].

Investment Share of GDP(X3) Many of the countries in the study experienced steady or high rate of growth in population and labor force. As investment in capital increased, the result would be increased output per worker. One would therefore expect a positive relationship between output per person and increased capital accumulation. Increased investment would enable better maternal care, and therefore would reduce infant mortality. The data for investment share was derived from the Penn World Tables.

Change in Human Capital (X4) is measured in terms of growth in secondary school enrollment rates. It is the ratio of total high school enrollment to the normal high school age. Growth in human capital measures the increase in education, in knowledge and in skills of the population. This growth should be positively related to growth in GDP/capita, and should decrease child mortality[13] The data for human capital were derived from the World Bank Devdata.

Change in Exports (X5). Net exports is one of four variables (the others being consumption, investment and government expenditures) in the calculation of GDP. Increase in exports should be positively related to increased GDP/capita. It should also help to reduce infant mortality. Data for exports came from the World Bank Devdata for 1984 – 2004.

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[11] Data for initial GDP/capita, investment share of GDP/capita and changes in real GDP/capita in constant 2000 US dollars, and for the period 1985 to 2004, were derived from the Penn World Tables, Version 6.2, by Alan Heston, Robert Summers and Bettina Aten at the center for International Comparisons of Production, Income & Prices, 2005.

[12] Labor Force data (total and growth figures) were derived from various search configurations of the World Bank Devdata for Africa, Asia, OECD and Europe, from 1980 to 2004.

[13] Jamison, Jamison and Hanushek, in "Effects of Education Quality on Income Growth and Infant Mortality Decline". National Bureau of Economic Research, Cambridge, Mass, October, 2006, show that education quality influences economic growth positively, and infant mortality increase negatively.

Infant Mortality. Data on infant mortality came from the World Health Organization[14]. It measures the number of deaths per thousand of under one-year-old babies who were born alive. Infant mortality is the dependent variable for Table 4 in the appendix. Mortality rates, in addition to income levels, are indicators of the well being of any economy (Jamison et al, 2006). In this paper, we use infant mortality as a surrogate for comprehensive development. Jamison, Jamison and Hanushek (Oct. 2006), find that education quality (using scores in countrywide tests) is positively related to technological progress, and that this is also related to reductions in infant mortality. There was a strong association, in their study, between the quality of education and reduction in infant mortality.

III a. Methodology and Estimation of Impacts

Two equations are estimated in our study. The first is the augmented Solow growth model, as used by Vijayaraghavan and Ward (V&W)[15]. The second is a Cobb-Douglas production function model, used by Augustine Fosu in a study of the impact of political instability on growth, in Sub-Sahara Africa.
The first equation is of the form:

$\dot{Y} = \beta_0 + \beta_1$ Init GDP/capita $+ \beta_2 \Delta L + \beta_3 \Delta$ Inv $+ \beta_4 \Delta HC + \varepsilon$ ---------- (1)

$\dot{Y}$	= Growth GDP/Capita
Init GDP/Capita (X1)	= Initial period value of GDP per Capita
ΔL (X2)	= Labor force change
ΔLn (X3)	= Change in investment share of GDP (represents physical capital)
ΔHC (X4)	= Change in human capital
ε	= The error term

β_0 is the intercept. β_1, β_2, β_3, and β_4 are the coefficients of Init.GDP, labor force, investment share and human capital. We modified equation 1 to include the institutions as independent variables X_5.

$\dot{Y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$ ---------- (1b)

The second equation that was explored was of the type:

$\dot{Y} = \beta_0 + \beta_2 X_2 + \beta_3 X_3 + \beta_6 X_6 + \varepsilon$ ---------- (2)

$\dot{Y}$	=	Growth in per capita GDP
X_2	=	Growth in the labor force
X_3	=	Growth in the Investment Share
X_6	=	Growth in Exports
β_0	=	The vertical intercept
β_2	=	The labor force coefficient
β_3	=	The investment coefficient
β_6	=	The export coefficient

III b. Table1: Testing the Suitability of Equations 1 and 2 and the data for OLS (Ordinary Least Squares) Regression. The Tables are in appendix B.

[14] World Health Reports, various issues
[15] Institutions and Economic Growth: Empirical Analysis by Maya Vijayaraghavan and William Ward of Clemson University

The purpose of models 1 through 6 is to test the equations and the data for compliance with the assumptions of OLS regression, and to assess to what extent our data violate or do not violate any of the assumptions[16]. Model 1 meets all the assumptions.

The OLS regression will be valuable using this equation. The output gives the expected signs for all the independent variables (Init GDP/Capita, labor force growth, investment share and growth in human capital). Only the init GDP and investment share are significant at both the 95% and 99% confidence level. r^2 is 44.88%, and the adjusted r^2 is 40.38%.

Equation 1 is tested using models 2 and 3. This is to verify whether labor force and human capital would reduce the relevance of each other in the analysis. So in model 2 the labor variable is removed. All the variables are significant in model 2, at the 95% level, but r^2 is slightly reduced at 42.95%. The residuals are quite strong for BP, JB and DB (see note # 16).

Human Capital variable is dropped in model 3. All the variables are significant at the 95% level, except the intercept. The r^2 and the adjusted r^2 are similar to model 2. There is not much difference whether labor force alone or human capital alone is used. When they are used individually, each shows significance. When they are used together, none is significant, even though r^2 and the adjusted r^2 are slightly higher, as in Model 1

Equation 2 is tested using models 4 and 5. Labor force change, investment share and export growth are the independent variables used in model 4. This formulation violates JB assumption, with a score of 0.022%. The residuals are not normally distributed. This problem may not be very serious. It points to the fact that some of the variables may be so closely related that one would have difficulty separating the individual impact on the dependent variable. When human capital is used in model 5, instead of labor force change, there is a very slight, but not much, improvement in the JB score, 0.193%. Model 5 shows only the export variable and the intercept as significant. Both investment and human capital are insignificant. The r^2 and the adjusted r^2 are reduced slightly to 45.56 and 42.30 from model 4, which has scores of 46.66% and 43.46%.

[16] A regression model has four basic assumptions that should be satisfied, if there is to be any confidence in the output. Kalibanoff, Sandroni, Moselle and Saraniti "Managerial Statistics – A Case-Based Approach", 2006, page 181, give these assumptions as: linearity, constant error of variance, independent errors, and normal errors. Linearity can be checked by plotting the residuals. Constant error of variance (homoskedasticity, violation is heteroskedasticity), we can check with the Breusch-Pagan residual heteroskedasticity test. We can detect lack of independence of the variables by checking the Durbin-Watson statistic of the residuals. The non-normality of the errors can be detected by the use of the Jargue-Bera non-normality test. The Breusch-Pagan heteroskedasticity (BP) test was 23.604%. A score close to 0% would have confirmed that the variances of the residuals were different. The Jargue-Bera (JB) non-normality test was 10.72%. A score close to 0, would indicate non-normality of the residuals. The Durbin-Watson (DB) statistic was 1.64. A score of 2 gives perfect no autocorrelation. A score of 0 gives strong negative autocorrelation, and a 4 gives a perfect positive autocorrelation.

Models 6, 7 and 8 are partial logarithmic transformations of the independent variables, except the labor force. Models 6 and 7 use the natural logs of init GDP, investment share and human capital (in model 7 alone). Model 6 shows all the variables significant at either the 95% or the 90%. When Ln of human capital is added in Model 7, it is not significant. All the other variables are. Model 8 uses equation 2 with the partial logs of the variables. All show the expected signs, and are significant, except the labor force growth. r^2 and the adjusted r^2 are 43.83 and 40.46%, which are acceptable, but not much improved from the other models.

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III c. Impact of the Institutions on GDP/Capita Growth Considering Convergence.

Table 2, uses equation 1 formulation to test the contribution of the institutions to economic growth per capita. This equation is of the form:

$$\dot{Y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon \text{ ---------- (1b)}$$

Models 9 through 14 use equation 1b, and model 1 tested in table1, in a stepwise regression, to assess the impact of the institution variables, on GDP/Capita growth. Model 9 tests voice and accountability (VA). All the signs are as expected. All the variables except labor force, human capital and the intercept are significant. VA is significant at the 90% confidence level. Its elasticity is 0.8768, indicating that a 1% change in VA would change GDP/Capita by 0.88%. We also observe the beta-weight (a standardized impact coefficient) is 0.353. This means that if VA changes by 1 standard deviation, the growth in GDP/Capita will change by 0.353 standard deviations.

Model 10 assesses the impact of political instability (PI) on growth of GDP/Capita. We observe that labor; human capital and the Intercept are not significant. PI and the other variables are significant at the 95% level. r^2 and the adjusted r^2 are improved a little from model 9. The elasticity of PI is not as high as in VA. The beta-weight, 0.3307, is less than for VA. Equation 1 indicates that PI is not as important as VA for growth. Model 11 tests government effectiveness, and uses the same non-institutional parameters as in models 9 and 10.

A number of differences are observed. The labor and human capital variables are still not significant. The intercept, the initial GDP/Capita, investment share and government effectiveness (GE) are significant. GE is significant at the 99% level. The elasticity of GE with respect to growth in GDP/Capita is 1.99, and the beta-weight is 0.9329, the highest so far. Models 12, 13 and 14, show that the other institutions that are next in impact to the GE are the rule of law (RL), and the regulatory quality (RQ). Model 11 shows the highest r^2 and adjusted r^2 .

According to Table 2, the descending sequence of greatest impact would be: government effectiveness, rule of law, regulatory quality, control of corruption, voice and accountability, and political instability. Using the greatest impact institution, we try to see if the log functions would make any difference, in the regression. One would then eliminate labor or human capital (since it looked like they would reduce their respective impacts when used together) from the formulations. In model 15, labor and human capital are included, using the logarithms of Init GDP, investment share and human capital. All the parameters are significant except labor. r^2 and the adjusted r^2 are 60.23% and 60.18%. It is

considerably improved from models 9 through 14. The human capital turns significant, even with labor still in the equation. Only the labor parameter remains insignificant. The labor parameter is dropped in model 16. All parameters are significant at the 95% or the 90% level. There is no improvement in the r^2 at 60.18%, but there is some improvement in the adjusted r^2 at 56.93%.

Next in importance to GE is RL. This includes property rights, which a number of researchers (V&W, 2006, and others) found to be the most important institution with respect to impact on economic growth. The others are RQ, CM, VA and PI.

That political stability and voice & accountability have very little impact on growth at this point, is not surprising, given our discussion earlier (sections II(i) & II(ii)).

III d. Assessing the impact of Institutions on Growth Per Capita, not considering Convergence.

Table 3A uses equation 2, includes change in exports, but does not include Initial GDP/capita as one of the independent variables. This is the formulation tested in models 4, 5 and 8 in Table1. Restated here, equation 2 is of the form:

$$\dot{Y} = \beta_0 + \beta 2\, X_2 + \beta_3 X_3 + \beta_6 X_6 + \varepsilon \quad \text{---------- (2)}$$

$\dot{Y}$ = Change in GDP/capita
X_2 = Labor force change
X_3 = Investment share of GDP (capital)
X_6 = Change in exports

We use change in exports, as an independent variable, in model 18, and its natural logarithm in model 19. While model 18 shows a higher r^2, model 19 turns out to be superior in two respects. The residual plot of model 18 shows a non-linear pattern, and the JB test for normality is 0.022%, which is close to zero. The residual plot for model 19, is more linear, and the JB test score is 1.877, which is not very high, but higher than for model 18. We use model 19 to test and compare the impact of the institutions. Models 20 to 25 in Table 3A show OLS regression results, using equation 2.

The order of importance, with respect to the impact of the institutions, changed from that using equation 1. Political stability and regulatory quality show higher impact. Change in exports is significant at the 95% confidence level in models 20, 24 and 25, and significant at the 90% confidence in models 21, 22 and 23. The constant term, β_0, is significant in all the models. Only two of the institutions, political stability and regulatory quality are significant at the 90% confidence level. Looking at the specifics of the institutions, one sees a change in standing from the sequence in Table1. Regulatory quality, followed by political stability, and then government effectiveness, make the greatest impact. Government effectiveness lacks significance. But the other two are significant at 90%.

With an elasticity of 0.6733, one percent change in RQ would change growth in GDP/capita by 0.67%. It also shows a beta-weight of 0.277, indicating that a change of one standard deviation in regulatory quality would change GDP/capita by .277 standard deviations. Political stability closely follows this at 0.2743 standard deviations. Government effectiveness would change GDP/capita by 0.2009 standard deviations. As usual, all the other parameters are significant, except the labor force. The r^2 and the adjusted r^2 , at 47.1 and 42.69; 47.49 and 43.20; 45.04 and 40.55, are very close for the three institutions of regulatory quality, political stability and government effectiveness. The mixed impact of

political stability, discussed in section II(ii), seems to be manifesting itself in this analysis.

III e. Assessing the impact of paired institutions on growth per capita.

Recognizing that these institutions may tend to work together, and that a country might choose to devote resources to more than one institution at a time, we entered them in the regression analysis in pairs, using equation 2, which seemed to be weaker than equation 1. This is reported in Table 3B. We are concerned, of course, that there would be cases of multi-collinearity, where one variable is significantly dependent on the other. So we check the variance inflation factors[17] in our residual analysis. We analyze the paired institutions using models 20b to 29b[18]. We start off taking the institutions with the greatest impact (government effectiveness, regulatory quality and political stability), pairing them with the institutions that show weaker impact. Our next step is to then pair the institutions with the greatest impact, and then pair the weakest ones.

The best performance is the combination of government effectiveness and corruption control, model 23b, followed by regulatory quality and corruption control, model 25b. Their r^2 and adjusted r^2 are 55.89% and 51.29%; and 54.65% and 49.58%. In each case the institution parameters are significant at the 99% level. Model 23b shows some collinearity between the two institutions, but the residuals satisfy all the other OLS regression assumptions[19]. Model 25b does not show collinearity, but barely makes the JB residual normality test, with a score of 0.602%[20].

III f. The impact of institutions on Infant Mortality (comprehensive development).

Table 4 shows the results of the institutions on Infant Mortality, using modified versions of equations 1 and 2. The estimated equation is of the form:

$$\text{Ln IM} = \beta_0 + \beta 2\, X_2 + \beta_{14} X_{14} + \beta_{15} X_{15} + \beta_i X_i + \varepsilon$$

X_2 = Labor force growth
X_{14} = Ln investment
X_{15} = Ln human capital
X_i = The institutional variables.
i varies from 7 to 11

The dependent parameter used is the natural logarithm of the infant mortality rates of the countries. Models 30 to 35 give stepwise regression with the institutions. We tested the regression assumptions. All the models satisfied all the assumptions of OLS Regression. Models 30 and 31 barely made the non-normality test. But the other tests were very strong. The JP heteroskedasticity test was very strong, Durbin Watson was very near to 2, JB non-normality test was more than 2 in each case, and there were no multi-collinearity problems.

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[17] Variance Inflation factor would give a measure of how strongly the uncertainty in the coefficient of an independent variable is influenced by collinearity-dependence of the variable on another independent variable. When the factor is 10 or more, there is substantial collinearity problem (KStat residual analysis foot notes).

[18] We do not show models 28b and 29b just to save the number of pages in this document. Will be glad to supply them if needed.

[19] Please see foot note 16

[20] Footnotes 16 & 17

Only Table 4 in the whole study has all the variables, except labor, significant at the 99% level. Labor force is significant at 90%, in model 33. This is also the only table where both labor and human capital parameters are significant at the same time.

Rule of law, in model 31, demonstrates superiority over all other institutions, with r^2 and adjusted r^2 of 91.80% and 91.13 %. The rule of law has an elasticity of 0.5213. The beta-weight is 0.4592. The only problem with the rule of law is a slight lack of normality in the residuals. Government effectiveness, model 29, is a very close second to the rule of law. It has r^2 and adjusted r^2 of 91.72 and 91.04. Its elasticity is .5165, and a beta-weight of 0.4620, just about 0.5 as in Model 31. All the parameters for this model are significant at the 95% level or better. Even the labor force parameter is significant (at 90%).
Corruption control, model 32, is a close third with r^2 and adjusted r^2 of 91.67 and 91.00. The elasticity is 0.4696, and the beta-weight is 0.4338. Regulatory quality, model 30, is fourth in impact. Political stability is fifth and voice and accountability is 6th.

That the rule of law and corruption control should have substantial impact on Infant Mortality is not surprising. Even though our data and analysis of economic growth did not show these two as having the most impact on economic growth, many studies have shown that they are very important for economic development, especially in the areas of contractual obligations and property rights. Richard Messick[21] stated that " The 15th century jurist John Fortescue asserted that medieval England's prosperity was traceable to the quality of the English legal institutions. Almost 300 years later Adam Smith observed that 'a tolerable administration of Justice,' along with peace and low taxes was all that was necessary to 'carry a state to the highest degree of opulence' ". Given the impact of the rule of law on economic growth, the connection between economic growth and infant mortality through such areas as improved education, better health care services and better maternal care would necessarily follow.

Similarly, a well run bureaucracy, government effectiveness, would enhance the chances of good education, good welfare systems and good medical facilities, which should all add up to lower infant mortality.

III g. Table5: Africa Infant Mortality Analysis

We tried to use equations 1 and 2 to analyze data from Africa, South of the Sahara with respect to economic growth. Each time, it would seem that none of the institution parameters was significant. That was not the case when we did a regression against infant mortality in Africa.

Table 5 models 36 through 41 give the analysis using Africa alone, and a modified version of equation 2. Model 38, government effectiveness, demonstrates superiority over all the other parameters. Model 40, the rule of law, follows closely behind. None of the other institution variables shows any significance. Model 38 shows that government effectiveness is significant at the 90% level. But for the labor force parameter, all other variables associated with

[21]Richard E Messick – Judicial Reform &Economic Development. A Survey of Issues: The World Bank Research Observer Vol.14. no1 (Feb. 1999) pp 117-136.

Model 38 are significant either at the 95% or 90% level. r^2 and adjusted r^2 are 63.34 and 57.70. Its elasticity is 0.1884, and the beta-score is 0.2643, higher than any other institutional variables.

Model 40, the rule of law, is the other model that shows institutional significance in the all-Africa analysis. Again, except for the labor force parameter, all variables show significance at the 95% level or at the 90% level. r^2 and adjusted r^2 are 63.8% and 57.39%. The elasticity is 0.1799, and its beta-score is 0.2551.

IV. Conclusion

We have used a fairly simple statistical means to demonstrate that some institutions are indeed more critical than others, with respect to a country's development. We have also shown that it matters whether the goal is economic growth or comprehensive development. Government effectiveness demonstrates a clear pattern of superiority, in impact, on growth and comprehensive development. With regard to growth, government effectiveness shows the highest impact when we use the augmented Solow Growth model, with convergence. When tested against infant mortality, even with Sub-Sahara African data alone, government effectiveness shows the most impact, coming very close second to rule of law in one of the formulations. It did not do as well when tested against growth, using the Cobb-Douglas Production Function of equation 2. But in 4 out of 5 cases tested, it was either of the most impact, or a very close second. For the other institutions, the rule of law showed very strong impact on mortality, and regulatory quality showed greatest impact on growth using the Cobb Douglas formulation. Different institutions could have different impacts, depending on whether growth or comprehensive development was the focus.

Our study has a number of limitations, which indicate opportunities for further research in this area. One obvious limitation is the paucity of data, especially of the Sub-Saharan countries in Africa. This seems to be improving, given the activities of the World Bank, the United Nations, and individual country statistical offices. If data were more available, one would be able to analyze individual countries. One could study which institutions would do best for which countries. One could measure how much development would be achieved with what level of institutional improvement efforts.

The second limitation is our selection of countries inside and outside of Africa. One is not sure whether a formal random selection of the countries would have made some difference. Would we have arrived at different results if we had included more Latin American countries? Would it have mattered if all sub-Sahara African countries had been included, or if only a specific region was included? Some studies (de Hann and Siermann) found different impact relationships using regional data.

The third limitation is that OLS Regression gives association between the variables, but does not always show causality. In which case, we have shown very strong association between government effectiveness and development, economic and comprehensive. We have not shown that government effectiveness would necessarily cause high economic growth or high reduction in infant mortality or reduction in poverty. It's possible that some other econometric formulation would be better at indicating causality. Our analysis falls short in that respect.

The fourth limitation has to do with the institutions and their definitions. There are probably more institutions than we used in our study, depending on how they are defined.

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APPENDIX A;
Countries in the Analysis

Benin	Gabon	Namibia	Belgium	Portugal
Botswana	Gambia	Niger	Canada	United Kingdom
Burkina Faso	Ghana	Nigeria	Denmark	United States
Burundi	Guinea	Senegal	Finland	Bangladesh
Cameroon	Kenya	South Africa	France	China
Central African Republic	Liberia	Tanzania	Germany	India
Chad	Mali	Uganda	Greece	Japan
Congo Zaire	Mauritania	Zambia	Ireland	Korea, Republic of
Congo Brazzaville	Mauritius	Zimbabwe	Italy	Malaysia
Ethiopia	Mozambique		Norway	Pakistan
			Singapore	Thailand

APPENDIX B:
Analysis TABLES

Table 1
Change in constant GDP/capita against initial GDP, changes in labor force, investment, human capital and exports

Variables		model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8
Intercept	B_0	0.850 (0.557)	-1.037** (-2.0317)	-1.886 (1.3905)	-0.6325 (-0.5963)	-2.2265** (-3.3305)	5.4912*** (1.805)	5.718*** (1.9011)	-3.849** (-2.2999)
1985 init GDP/capita	X1	.-.00024** (-3.3951) -0.7282*	-.00021** (-3.1337) -0.6508*	-.00018** (-3.0988) -0.5577*					
labor force growth	X2	-0.6096 (-1.3112) -0.2413*	_____	-0.867** (-2.0038) -0.3433*	-0.5146 (-1.4818) -0.2037*		-.7433*** (-1.9099) -0.2943*	-0.658*** (-1.6932) -0.2604*	-0.2676 (-0.8058) 0.3858)
investment share	X3	0.15** (3.4367) 0.5790*	0.1457** (3.3245) 0.5621	0.1852** (5.0867) 0.7145*	0.0778** (2.0807) 0.3002*	0.07116 (1.4455) 0.2745*			
human capital	X4	0.0243 (1.43) 0.3908*	0.0329** (2.087) 0.5302*	_____		0.01196 (1.0712) 0.1926*			
change in exports	X6				0.3265)** (3.7609) 0.4455*	0.3147** (3.527) 0.4294*			
Ln init GDP	LnX1						-1.166)** (-3.3506) -0.6001*	-1.548)** (-36306) -0.7967*	
Ln investmt	LnX3						2.8563** (5.2026) 0.8001*	2.507** (4.2564) 0.7023*	1.3766** (2.8434) 0.3858*
Ln human capital	LnX4							0.95 (1.5131) 0.3400*	
Ln exports	LnX6								1.4878** (3.5676) 0.3962*
r^2		44.88	42.95	42.95	46.66	45.56	42.45	45.02	43.83
Adjusted r^2		40.38	39.53	39.15	43.46	42.30	39.00	40.53	40.46
F statistic		9.976	12.5474	12.3655	14.5779	13.95	12.29	10.03	13.0031
Significance for F, p-value		0.00055 %	0.00031 %	0.00036 %	0.00006 %	0.00010 %	.000038 %	.00052%	0.00021 %
Degrees of Fr		(4, 49)	(3, 50)	(3, 50)	(3, 50)	(3. 50)	(3, 50)	(3, 50)	(3, 50)

** Significant at 95% confidence level. Critical t is 1.66, and t's are in parenthesis.

*** Significant at 90% level. * Beta-weight values; std change in dependent variable per standard deviation change in the independent.

Table 2

The modified Solow model used in Table1, with the basic independent variables, except labor, and the governance variables, x6, thru x11, for change in GDP/capita dependent variable

Variables		model 9	model 10	model 11	model 12	model 13	model 14	model 15	model 16
intercept	B0	0.9731 (0.6519)	1.3450 (0.9012)	3.0377** (2.1119)	2.22108 (1.5427)	2.3085 (1.5312)	2.1437 (1.3595)	12.6193** (4.1440)	12.28** (4.5319)
init GDP/capita	X1	-0.0003** (-3.7542) -0.8008*	-0.00028** (-3.924) -0.8378*	-0.0004** (-5.3062) -1.1178*	-0.0003** (-4.5837) -0.9315*	-0.0004** (-4.6056) -1.0587*	-.00034** (-4.1797) -1.0415*		
labor force growth	X2	-0.3720 (-0.7873) -0.1473	-0.4659 (-1.0260) -0.1845*	-0.5105 (-1.2557) -0.2021*	-0.5518 (-1.3091) -0.2185*	-0.4512 (-1.0337) -0.1786*	-0.55842 (-1.2478) -0.2211*	-0.09111 (-0.2538) -0.0361*	
investmt share	X3	0.1642** (3.7884) 0.6334*	0.1361** (3.1881) 0.5248*	0.10306** (2.5862) 0.3975*	0.11783** (2.8982) 0.4545*	0.12245** (2.9321) 0.4723*	0.13311** (3.1215) 0.5135*		
human capital	X4	0.0125 (0.7002) 0.2010*	0.0208 (1.2618) 0.3354*	0.00448 (0.2864) 0.0721*	0.012 (0.7581) 0.1931*	0.01124 (0.6826) 0.1810*	0.01456 (0.8605) 0.2343*	0.9690*** (1.7962) 0.3469*	
Ln init GDP/capita	X12							-2.3756** (-5.7354) -1.2224*	-2.3648** (-5.7953) -1.2168*
Ln investment Share	X14							1.8092** (3.4024) 0.5068*	1.8023** (3.4267) 0.5048*
Ln human capital	X15								0.988*** (1.8671) 0.3536*
governance1 (voice&acct)	X7	0.8768*** (1.8239) 0.3530*							
governance2 (political stab)	X8		0.8109)** (2.1246) 0.3307*						
governance3 (govt effectiveness)	X9			1.9929** (4.0364) 0.9329*				1.8089** (4.2854) 0.8469*	1.8484** (4.7555) ().8653*
governance4 (regulatory quality)	X10				1.4625** (3.4195) 0.6006*				
governance5 (rule of law)	X11					1.5484** (2.9082) 0.7139*			
governance6 (corruption mitigation)	X12						1.17278** (2.2396) 0.5671*		
r^2		48.46	49.62	58.85	55.68	53.14	50.10	60.23	60.18
Adjusted r^2		43.09	44.37	54.56	51.06	48.26	44.90	56.09	56.93

*** Significant at 90%; ** significant at 95%. * measures beta-weight, the std impact on the dep. variable by 1 std change in the independent.

Table 3A
Exports and Log of Exports included in Equation2

Variables		model 18	model 19	model 20	model 21	model 22	model 23	model 24	model 25
intercept	B0	-0.6325 (-0.5963)	-3.8491** (-2.2999)	-4.02397** (-2.3562)	-3.7286** (-2.2794)	-3.6172** (-2.1441)	-3.5195** (-2.1291)	-3.7881** (-2.2465)	-3.8650** (-2.2832)
labor force growth	X2	-0.5146 (-1.4818) -0.2037	-0.2677 (-0.8058) -0.1060*	-0.0972 (-0.2238) -0.0385*	0.0420 (0.1151) 0.0166*	-0.01582 (-0.0385) -0.0063*	0.0439 (0.1177) 0.0174*	-0.10189 (-0.2411) -0.0403*	-0.3078 (-0.7441) -0.1219*
investment share	X3	0.0778** (2.0807) 0.3002*							
Ln investment share	LnX 3		1.3766** (2.8434) 0.3856*	1.29222** (2.5531) 0.3620*	1.0201*** (1.9975) 0.2857*	1.0604*** (1.8555) 0.2970*	0.9714*** (1.8314) 0.2721*	1.1966** (2.1278) 0.3352*	1.4210** (2.5488) 0.3981*
change in exports	X6	0.3265** (3.7609) 0.4455*							
Ln change in exports	LnX 6		1.4878** (3.5676) 0.3962*	1.50155** (3.5731) 0.3999*	1.6252** (3.9253) 0.4328*	1.4637** (3.5073) 0.3898*	1.4624** (3.5721) 0.3895*	1.4995** (3.5710) 0.3994*	1.4853** (3.5247) 0.3956*
governance1 (voice&acct)	X7			0.2633 (0.6157) 0.1060*					
governance2 (political stab)	X8				0.6727*** (1.8486) 0.2743*				
governance3 (govt effectiveness)	X9					0.4292 (!.0394) 0.2009*			
governance4 (regulatory quality)	X10						0.6733*** (1.7169) 0.2765*		
governance5 (rule of law)	X11							0.2679 (0.6405) 0.1235*	
governance6 (corruption mitigation)	X12								-0.06359 (-0.1658) -0.0307*
r^2		46.66	43.83	44.26	47.49	45.04	47.01	44.29	43.86
Adjusted r^2		43.46	40.46	39.71	43.20	40.55	42.69	39.74	39.27

** statistically significant at the 95% confidence level. * beta-weight values- no of standard deviations change in dep. variable if the independent is changed by one standard deviation.

Table 3B
Equation2 with the institutional variables paired together in the analysis.

Variables		model 20b	model 21b	model 22b	model 23b	model 24b	model 25b	model 26b	model 27b
intercept	B0	-3.8392** (-2.3005)	-3.6463** (-2.2107)	-3.1597** (-1.8301)	-2.661*** (-1.7139)	-3.2141** (-1.9853)	-3.2399** (-2.0926)	-3.624** (-2.1780)	-3.8605** (-2.4327)
labor force growth	X2	-0.031684 (-0.0782) -0.0125*	-0.16319 (-0.3980) -0.0646*	-0.115984 (-0.2772) -0.0459*	-0.13432 (-1.7139)	-0.32041 (0.7793) -0.1268*	-0.3555 (0.9456) -0.1407*	0.0808 (0.2144) 0.0320*	-0.2816 (0.7259) -0.1115*
human capital	X4								
Ln investment share	LnX3	1.1211*** (1.9855) 0.3140*	1.2105** (2.1431) 0.3391*	1.0177*** (1.7834) 0.2851*	0.9057*** (1.7442) 0.2537*	1.2307** (2.3019) 0.3447*	1.285** (2.5296) 0.3599*	0.9554*** (1.7937) 0.2676*	1.3645** (2.6088) 0.3822*
Ln change in exports	LnX6	1.6754** (3.8684) 0.4462*	1.4888** (3.6470) 0.3965*	1.30798** (2.9938) 0.3484*	1.1545** (2.9729) 0.3075*	1.3399** (3.3153) 0.3569*	1.3429** (3.4881) 0.3576*	1.5718** (3.6358) 0.4186*	1.7243** (4.2656) 0.4592*
governance1 (voice&acct)	X7								
governance2 (political stab)	X8	0.84669 (1.5616) 0.3463*						0.4648 (0.8125) 0.1895*	1.3496** (2.7859) 0.5504*
governance3 (govt effectiveness)	X9	-0.262123 (-0.4359) -0.1227*	-1.146596 (-1.1935) 0.5368*	1.952627 (1.4214) 0.9141*	3.7041** (3.6178) 1.7340*				
governance4 (regulatory quality)	X10		1.6799*** (1.8075) 0.6899*			2.0491** (2.4999) 1.5894*	2.1102** (3.3799) 0.8666*	0.290675 (0.4736) 0.1194*	
governance5 (rule of law)	X11			-1.606335 (-1.1623) -0.7406*		-1.618*** (-1.8973) -0.7456*			
governance6 (corruption mitigation)	X12				-3.2335** (-3.4358) -1.5634*		-1.6867** (-2.8431) -0.8155*		-1.0067** (-2.0384) -0.4868*
r^2		47.70%	48.54%	46.54%	55.89%	50.71%	54.65%	47.73%	51.67%
Adjusted r^2		42.25%	43.18%	40.97%	51.29%	45.58%	49.93%	42.29%	46.64%
F statistic		8.7539	9.0555	8.3582	12.1621	9.8765	11.5689	8.7670	10.264
Degrees of Fr		5,48	5,48	5, 48	5.48	5,48	5, 48	5, 48	5, 48
Significance for F, p-value		0.00059 %	0.00041 %	0.00096 %	0.00001 %	0.00015 %	0.00002 %	0.00058 %	0.00010 %

** statistically significant at the 95% confidence level. * beta-weight values- no of standard deviations change in dep. variable if the independent is changed by one standard deviation. *** significant at 90% level

Table 4

Log of Infant Mortality is Dependent Variable against the Table2 Independent Variables

Variables		model 30	model 31	model 32	model 33	model 34	model 35		
intercept	B0	6.3606* (12.1236)	6.1993** (11.7283)	5.5639** (12.1779)	0.58305** (12.2313)	5.718192** (12.7891)	5.7483** (12.7852)		
labor force growth	X2	0.2458** (2.2687) 0.1860*	0.3071** (3.1241) 0.2323*	0.1893** (2.2418) 0.1432*	0.2629** (3.0721) 0.1989*	0.1596*** (1.8496) 0.1208*	0.18337** (2.1528) 0.1387*		
Ln investment share	X14	-0.7267** (-5.0826) -0.3890*	-0.6723** (-4.5955) -0.3598*	-0.517** (-4.1126)	-0.5846** (-4.4551) -0.3129*	-0.5592** (-4.5567) -0.2993*	-0.5731** (-4.6555) -0.3067*		
Ln human capital	X15	0.39163** (-3.0986) -0.2679*	-04324** (-3.4745) -0.2958*	-0.266** (-2.4549) -0.1819*	-0.3434** (-3.0586) -0.2349*	-0.2745** (-2.5591) -0.1877*	-0.2844** (-2.6415) -0.1945*		
Ln change in exports	X16								
governance1 (voice&acct)	X7	-03074** (-2.9014) -0.2365*							
governance2 (political stab)	X8		-0.2591** (-2.8747) -0.2019*						
governance3 (Govt Effectiveness)	X9			-0.5165** (-5.850) -0.4620*					
Governance4 (regulatory quality)	X10				-0.4373** (-4.9359) -0.3432*				
governance5 (rule of law)	X11					-0.5213** (-5.9245) -0.4592*			
governance6 (corruption mitigation)	X12						-04696** (-5.8155) -0.4338*		
r^2		87.99	87.96	91.72	90.60	91.80	91.67		
Adjusted r^2		87.01	86.98	91.04	89.83	91.13	91.00		
F statistic		89.76	89.49	135.6079	118.0917	137.166	134.89		
Degrees of Fr		(4, 49)							
Significance for F, p-value		0.00000 %	0.00000 %	0.00000 %	.00000%	.00000%	.00000%		

** statistically significant at the 95% confidence level. * beta-weight values- no of standard deviations change in dep. variable if the independent is changed by one standard deviation

Table 5
Africa Infant Mortality Analysis

Variables		model 36	model 37	model 38	model 39	model 40	model 41		
intercept	B0	5.8245** (13.3863)	5.84449** (13.4355)	5.70899** (13.6428)	5.8572** (13.5808)	5.7334** (13.6534)	5.6499** (12.7399)		
labor force growth	X2	0.09907 (0.8540) 0.1193*	0.1013 (0.8763) 0.1219*	0.05794 (0.5284) 0.0698*	0.0926 (0.8145) 0.1115*	0.0597 (0.5421) 0.0719*	0.0753 (0.6703) 0.0906*		
Ln investment share	X14	-0.2632*** (-1.9400) -0.2697*	-0.2680 (0.1347) -0.2746*	-0.2481*** (-1.9502) -0.2541*	-0.2830** (-2.1587) -0.2899*	-0.255** (-2.0053) -0.2612*	-0.2332*** (-1.7380) -0.2388*		
Ln human capital	X15	-0.3371** (-3.9726) -0.5526*	-0.3418** (-4.0479) -0.5605*	-0.3000** (-3.5953) -0.4919*	-0.3339** (-3.965) -0.5475*	-0.3026** (-3.6222) -0.4962*	-0.3030 (-3.4813) -0.4968*		
Ln change in exports	X16								
governance1 (voice&acct)	X7	-0.071 (-0.7927) -0.1126*							
governance2 (political stab)	X8		-0.053717 (-0.7672) -0.1059*						
governance3 (govt effectiveness)	X9			-0.1884*** (-1.8840) -0.2643*					
governance4 (regulatory quality)	X10				-0.0950 (-1.0404) -0.1408*				
governance5 (rule of law)	X11					-0.1799*** (-1.8266) -0.2551*			
governance6 (corruption mitigation)	X12						-0.1699 (-1.4403) -0.2186*		
r^2		59.32	59.26	63.34	60.00	63.08	61.42		
Adjusted r^2		53.06	52.99	57.70	53.85	57.39	55.48		
F statistic		9.4785	9.4546	11.2314	9.75	11.1035	10.3462		
Degrees of Fr		(4, 26)	(4, 26)						
Significance for F, p-value		.00728%	0.00741	0.00199 %	.00590%	0.00218 %	0.00377 %		

** Statistically significant at the 95% confidence level. * beta-weight values- no of standard deviations change in dep. variable if the independent is changed by one standard deviation. *** Significant at the 90% confidence level.