



## Institutions and Development: Are some more critical than others? – A Panel Study of 50 countries from 2002 to 2011<sup>1</sup>

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### ABSTRACT

Strong institutions are often viewed as part answers to Africa's development dilemma. But given the resource constraints of many African countries, one would need to be selective as to which institution or institutions to commit scarce resources. An attempt to strengthen all institutions at the same time could be rather daunting. And many questions would remain. First, what is the relative importance of one institution to another? Second, whether all institutions exert an equal impact on comprehensive development as they do on economic growth. This paper on Institutions and Development, first published in 2007 tries to answer these questions. It has been modified (in the 2016 version) for three reasons- 1, to bring the data up to date, 2, to use a different and possibly more accurate econometric model (fixed effect) for the analysis and 3, to assess if the same institutions remain more critical than others, as observed in 2007. Even though the rule of law institution would seem, in this revised version, to have a slightly better impact on GDP/Capita, government effectiveness is still dominant in both non-differenced and differenced models, especially when comprehensive development is considered.

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### 1.0 INTRODUCTION

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<sup>3</sup>.

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<sup>1</sup> The School of Business and Digital Media, Georgian Court University, Lakewood, NJ. This version of the paper contains corrections from the panel of blind reviewers at IJBSR. I thank them for their insightful comments. I am sure this paper is much better for it. I also thank my wife, Eunice Okpokwasili, for patiently reading and re-reading this paper every time changes were made to it, and finding errors that I could never have seen. This paper is undoubtedly better for such scrutiny. To the extent that the paper has any redeeming quality, the credit goes to the reviewers and to my wife. Any problems or short comings are mine and mine alone.

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<sup>3</sup> William Easterly and Ross Levine, Africa's Growth Tragedy, A Retrospective, 1960-1989

The primary goal of this revised paper, as was the case in the original paper, is to determine if any of the six institutions (voice and accountability, political stability, government effectiveness, regulatory quality, the rule of law and corruption mitigation efforts) are more critical than the orders, so that efforts directed to the particular institutions would be more beneficial on the whole. One recognizes the need for efficiency in all the institutions for the development of a nation. The problem is that many countries do not have necessary and sufficient resources to move all the institutions forward simultaneously. And even if countries had the necessary resources, these institutions could work together, and some may have the effect of improving others even when those others might not be specifically targeted. An effective governance structure, for instance, could promote less corruption and enable voice and accountability. The rule of law could have an impact on political stability and corruption; it would seem.

In this version of the study, however, we have taken two steps that, in our opinion, would make the study and its findings more reliable.

First, we employed a real panel data, the annual data for each country in the analysis, rather than the averages over the years. Secondly, we used differencing, in Tables 5 and 6, to more effectively address what could be seen as an econometric weakness. This approach would remove the unexplained variable effect on the Ordinary Least Squares (OLS) estimation of the panel data<sup>4</sup>. Such unexplained variable could result in unreliable regression estimates of the relevant parameters. Unfortunately, the differencing had the effect of reducing the panel data by one year.

We tried to include lagged variables for the countries, but abandoned it, since our initial results turned out not to have better confidence than without them. The Log-Log and Log-Linear transformations of the variables seemed to work quite well.

This 2016 analysis found improvement in both life expectancy and infant mortality in all the African countries, all coming from very low levels (in Life Expectancy) and very high levels (in Infant Mortality) relatively. Except for Liberia, per capita income went up for all the countries.

In assessing the importance of institutions on development, it made a difference whether one addressed economic growth or comprehensive development. Surrogates like life expectancy and infant mortality would be used to represent comprehensive development in this revised study, as was the case in the earlier study.

A determination of which institutions would have the greatest impact on development could help shape the policy directions of many developing countries, especially in the African region.

We found in the earlier study that Government Effectiveness (GE) was the institution, which if strengthened, would have the most impact on economic growth and comprehensive development.

The present study re-enforced the 2007 findings, but with some differences. It looked like the rule of law, when log differencing was applied to the stated methodology, was a slightly stronger institution than government effectiveness, in relationship to economic growth. Government effectiveness had much better show about comprehensive development.

The current paper analyzed the relative impacts of institutions on development, using the most recent data from 2000 to 2014. 50 countries were analyzed, most of them (29)<sup>5</sup> from Sub-Sahara Africa.

<sup>4</sup> Jeffrey Wooldridge, *Introductory Econometrics*, page 421

<sup>5</sup> The number of countries as well as the years covered by the statistical analysis are different because of data availability. We depended on the Penn World Tables Data (PWT) for consumption, gross investment, government spending and exports. Unfortunately, the most current PWT was V8.1, and had data through 2011. For consistency, we chose to stay with this source in most of the analyses. Some countries did not have data on TFP (Total Factor Productivity), forcing us to remove them from analysis.

The whole paper is structured as follows. Section 2 reviews the literature. Section 3 defines the variables used in this updated study and the methodology. Section 4 discusses the impact findings. Section 5 concludes the findings of the 2016 study. We list the participating countries in Appendix A

## 2.0 LITERATURE REVIEW

Why the development problems of the continent seemed to defy solutions (Easterly, 1998) has motivated numerous inquiries, many focusing on institutions. The question remained which institution and what development?

Some difficulties existed with the data derived entirely from the African sub-region, as Janine Aron aptly pointed out (Feb. 2000) – “given the very limited variation in the institutional indexes for African countries, often with serious endogeneity problems, there is little to gain on the role of institutions from studies focused solely on Africa”, This made it necessary to include data from other developed and developing countries. So this study included countries from Asia, Europe and North America (the list is given in Appendix A).

Fosu (1992) investigated the impact of Political Instability (PI) on economic growth. He concluded that PI had serious implications on economic growth. 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 result in output reductions. His study was a number of Sub-Sahara African countries, using a modified Cobb-Douglas production function.

Vijayaraghavan and Ward (2006) investigated the impact of each institution on economic growth, using 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, the 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. Vijayaraghavan and Ward (V&W) concluded 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, the rule of law and property rights would seem to be inseparable.

Government consumption does not mean efficient bureaucracy. Rauch and Evans found in their study of bureaucracy (weberianness score) that it was not the size of government that was the issue, but the structure of the bureaucracy<sup>6</sup>. 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 government size.

Mauro (1995) was one of the first economists to measure the impact of the institution on growth, using a composite of institutional measures, he concluded that corruption deterred private investment, and consequently was detrimental to economic growth. He also determined that bureaucratic efficiency might be, at least, as important for investment and growth, as political stability. Again he measured the impact of aggregated institutional measures.

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<sup>6</sup> 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.

Jamison, Jamison, and Hanushek (Oct. 2006), found that education quality (using scores in countrywide tests) was positively related to technological progress and that this was also related to reductions in Infant Mortality. They found a strong association between the quality of education and reduction in infant mortality. They joined the assertion that infant mortality was indicative of overall development, a thought process that Amartya Sen had championed<sup>7</sup>.

Janine Aron (2000) pointed out that many studies found the impact of democracy on growth to be inconclusive. On the positive side, she wrote that transparency and accountability would enhance economic growth. On the negative side, the delay introduced in seeking consensus, and interest group lobbies would delay responses to shocks and implementation of legislative mandates.

Just like democracy, there seem to be conflicting research findings on 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'état, 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 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.

Janine Aron (2000), finds that when property rights are included in the investment equation, PI (political instability) ceases to be significant. She says that PI, in many cases has no impact on economic growth. The problem with PI is that of endogeneity. Whereas PI could enhance growth, the reverse is also possible. We find a mixed impact. In some cases, PI has an impact. In other cases, its impact is not noticeable. Bayley (Dec. 1966) argued that corruption might not be as bad to development as one would think. He demonstrated that corruption might indeed 'wear two hats' – in fact playing a useful role in transition economies. He argued that corruption played a role, which could, in its absence, be played by another activity which might be more detrimental to the economy. Opportunity for corruption, he theorized, might indeed improve the quality of the civil servants, and could also result in increased allocation of resources from consumption to investment. Even though some studies have pointed to the benefits of corruption, the overwhelming evidence was that corruption was harmful to growth and harmful for infant mortality<sup>8</sup>.

### 3.0 DATA DEFINITIONS AND THE METHODOLOGY

This revised study started with a data set of 32 Sub-Sahara Africa countries, 12 from Western Europe & North America, and ten from Asia. The data covered a period of 14 years, from 2002 to 2015. Two factors accounted for whittling these numbers down both regarding countries and years covered, in the most recent study. First was the availability of the required data, and second was the differencing methodology which was applied in some of the models. The World Bank GDP/Capita data for 2015 was available for only very limited countries. The Penn World Table V8.1 had data through 2011. So we used data from 2002 to 2014 from the World Bank, and eventually reduced the years to 2002 to 2011.

The study employed natural logarithms of the components of the Gross Domestic Product (consumption spending, gross investment, government spending, and exports) as independent variables in some of the analyses. The original 2007 paper used the logs of labor and capital.

<sup>7</sup> Amartya Sen: Development as Freedom

<sup>8</sup> 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.

Two other independent variables were used with the differencing models- capital stock accumulation for each country, and TFP (total factor productivity). The two variables were shown to be influential in economic development. Data on capital was available for most African countries. TFP was hardly available for African countries. We found these variables to be of much significance in the log-linear or log-log relationships, with growth especially. They, however, forced some analyses with fewer than the 54 countries we started with.

The second factor was that differencing reduced the data by one year. So that the data used for each country from 2002 to 2014, would be reduced by one year when we subtracted year one from year two, year two from year three and so on. This was the price one paid for seeking a more reliable econometric approach. This was the major difference between the 2007 version and this revised, 2016 version of the paper.

### 3.1 INSTITUTIONS / GOVERNANCE MEASURES

Six governance measures (institutions) were derived from the World Bank Papers<sup>9</sup>. The six are described below.

(i) *Voice and Accountability (INST1)* measures the democracy in a country – the extent of political participation, the freedom of speech, and the freedom of the media. All the institutional scores are standardized. They vary from a low of –2.5 to a high of 2.5, with 0 (zero) as the mean. The higher the score, the better the country is, in the institution of democracy.

(ii) *Political Stability and Absence of Violence (INST2)* measures the likelihood that a sitting government would be thrown out of office by some non-democratic means.

(iii) *Government Effectiveness (INST3)* measures the quality of the bureaucracy. It is a measure of the effectiveness of the civil service, and its insulation from political pressures.

(iv) *Regulatory Quality (INST4)* measures the extent to which government regulations permit and promote private sector development. One would expect a positive relationship with GDP/Capita, and a negative relationship with increases in Infant Mortality (IM).

(v) *Rule of Law (INST5)* 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.

(vi) *Control of Corruption (INST6)* addresses the extent to which government checks 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 did not seem to support that.

#### 3.1.1 OTHER INDEPENDENT VARIABLES

(i) *TFP (Total Factor Productivity)* refers to measures of a country’s productivity, given its major factors of production, labor, and capital. These measures should be positively related to economic growth. It measures changes in production possibilities which would be possible due to the application of technology, human capital and all other resources with which a country is endowed. This could also be a reflection on how changes in the labor force might influence growth. One is the growth of capital/worker, and the other is unemployment. If labor grows without growth in capital investment, there would be a

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<sup>9</sup> 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. The most recent data is also from the World Bank- Kaufman, Krey et al at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1682130](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1682130)

decrease in capital per worker, and a decrease in output per worker. If unemployment increases as labor grow, there would also be a negative impact on output. We do not have unemployment figures available for most of the countries in the study, most of which are in Sub-Sahara Africa. The thinking is that unemployment is unusually high.

We expected a positive relationship with institutions. The signs were properly reflected, but with not much significance in all our measures.

Our data for TPF were derived from the Penn World Table V8 data.

(ii)*Capital Stock* at constant 2005 US \$. Measures the accumulation of plants and equipment used in the production of goods and services. The more capital stock an economy has, the higher their output, and more likely, the higher their economic growth. We had hoped to see positive relationships with institutions in the differenced models. The signs were as expected, and there seemed to be much significance with the measures of growth, much more so than comprehensive development.

(iii)*Private Consumption Expenditures, Gross Investment, Government Expenditures and Exports* at constant 2005 dollars are the expenditure approach to measuring the Gross Domestic Product, except that exports are net, not gross. In the earlier version of this paper, we employed Labor and Capital measures for a country's output of goods and services. This is more like the income approach to GDP since the measures of labor and capital are the primary components of the factors of production. Quite often the expenditure measures are more reliable and more frequent than the income measures. This is why we changed from our previous use of labor and capital – the Solow model. Capital and Labor are implied in the differenced models used in Tables 5 and 6, in the form of capital stock and total factor productivity.

### 3.1.2 DEPENDENT VARIABLES

(i)*Real GDP/Capita and Real GDP/Capita Growth* measure the Gross Domestic Product divided by the population of the country and its change, at a constant 2005-dollar value. It is a measure of how well a country is doing economically. We derived our figures from the latest World Bank Data Series.

(ii)*Infant Mortality*. Data on infant mortality were derived from the World Bank Data<sup>10</sup>. It measures a number of deaths per thousand of under one-year-old babies who were born alive. Infant mortality was 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.

(iii)*Life Expectancy*. Life expectancy at birth indicates the number of years a newborn is expected to live before death, in a country. The more developed a country, the higher the life expectancy. Very low life expectancy is a reflection of poor medical institutions, poor nutritional endowments and overall poverty in the availability of those features which enable citizens of a country to grow without unnecessary afflictions of sickness and death – a combination that Amartya Sen referred to in “Development as Freedom Thesis.”<sup>11</sup>

## 3.2 METHODOLOGY

We analyzed in this version of the study, a panel data set, collected for 50 countries for the years 2002 through 2011. By the time we were through, we would be analyzing data for about 50 countries over ten years. That was some 500 data items.

<sup>10</sup> Mortality rate, infant (per 1000 live births) World Bank Reports, derived from various United Nations and Country specific sources.

<sup>11</sup> Sen, Amartya, Development as Freedom, Oxford University Press, 2001.

The first set of analyses, reported in Tables 1 to 4, would employ non-differenced panel data. The model used, takes the form of equation (1) below. There are, of course, some statistical problems caused by the possibility of the unobserved independent variable in the model. This could cause problems of heteroskedasticity (non-uniformity of the variances of the error terms), possibly leading to unreliable OLS estimation.

The second model estimated, was a differenced version of equation 1, reported in Tables 5, supposedly corrects for the problem of the effect of unobserved independent variable possible in equation 1. This is equation two below. The log version is reported in Table 6 and gave much better estimates.

$$Y_{it} = \beta_0 + \alpha_2 t + \beta_1 (X_1)_{it} + \beta_2 (X_2)_{it} + \dots + \beta_k (X_k)_{it} + a_i + \epsilon_{it} \quad (1)^{12}$$

Where  $i$  represent the cross section observation, different countries

$t$  is time, 2002 to 2014

$X$  is independent variables (GDP components and Institution Variables)

$Y$  is dependent variables (GDP/Capita, Life Expectancy and Infant Mortality)

$d$  is dummy variables representing the years

$a$  unobserved constant variable, constant for the years.

$\epsilon$  error term incorporating all uncontrolled for variables independent variables.

We also estimated the differenced form of equation 1 (equation 2), whose results are in Tables 5 and 6:

$$\Delta \ln Y_{it} = \beta_0 + \beta_2 \Delta d + \beta_1 \Delta (\ln X_1)_{it} + \beta_2 \Delta (\ln X_2)_{it} + \dots + \beta_k \Delta (\ln X_k)_{it} + \Delta \epsilon \quad (2)$$

$\beta_0$  is the intercept.  $\beta_1, \beta_2, \beta_3,$  and  $\beta_4$  are coefficients.

$d_i$  = Dummy Variables for each year from 2002 to 2014

$\Delta \epsilon$  = Differences in the error term

$\Delta d$  = Differences in the error term

In the differenced models,  $X_1$  and  $X_2$  are TPF and Capital Stock.

#### 4.0 RESULTS AND IMPACT FINDINGS

Table 1 presents the result by using equation 1 and OLS to determine the impact of the institutions on growth, measured by GDP/Capita, and controlling for the four components of GDP (consumption, investment, government expenditures and exports), and year effects.

The purpose of models 1 through 9 was to estimate the relationships between the institutions and economic wellbeing, represented by Ln GDP/Capita for the different countries. This would be similar to the version we estimated in 2007. We analyzed the model's residuals for compliance with the four basic requirements of OLS<sup>13</sup>.

<sup>12</sup> Wooldridge, An Introduction to Econometrics, Chapter 13

<sup>13</sup> A regression model has four basic assumptions that should be satisfied, if we are to have confidence in their estimates. Kalibanoff, Sandroni, Moselle and Saraniti "Managerial Statistics – A Case-Based Approach", 2006, page 181, gives 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 (homoscedasticity, 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. For the Breusch-Pagan heteroskedasticity (BP) test a score close to 0 would have confirmed that the variances of the residuals were different. For the Jargue-Bera (JB) non-normality test a score close to 0, would indicate non-normality of the residuals. For the Durbin-Watson (DB) test a score of 2 gives perfect no autocorrelation. A score of 0 gives strong negative autocorrelation, and a 4 gives a perfect positive autocorrelation.

**Table 1:** All 50 Countries for 2002 to 2011

LN GDP/ CAPITA VS INSTITUTIONS, LN GDP COMPONENTS and &amp; YEAR DUMMIES

Variables		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
intercept	$\beta_0$	2.3729 (5.128)**	0.165 (0.3734)	3.6586 (9.316)**	3.446 (9.058)**	2.842 (7.413)**	2.219 (5.193)**	6.823 (7.281)**	6.4634 (7.027)**	5.8743 (5.959)**
Ln Cons Exp	X1	-0.513 (-8.86)**	-0.1043 (-1.7967)	-0.1825 (-3.944)**	-0.1509 (-3.33)**	-0.1811 (-3.88)**	-0.1814 (-3.454)**	-0.2231 (-4.465)**	-0.1778 (-4.09)**	-0.2449 (-4.68)**
Ln Gross Invstmts	X2	-0.5128*	-0.1042*	-0.1824*	-0.1508*	-0.181*	-0.1813*	-0.2229*	-0.1777*	-0.2447*
Ln Govt. Exp	X3	0.7378 (12.98)**	0.57488 (9.703)**	0.3216 (6.651)**	0.3181 (6.714)**	0.3703 (7.643)**	0.4747 (8.794)**	0.4113 (8.19)**	0.3832 (8.169)**	0.4446 (8.3969)**
Ln Exports	X4	0.7540* 0.3925 (9.765)**	0.5874* 0.3513 (8.295)**	0.3286* 0.2861 (8.427)**	0.3250* 0.2882 (8.678)**	0.3783 0.3379 (9.998)**	0.4851* 0.2947 (7.619)**	0.4202 0.2567 (7.942)**	0.392* 0.2529 (7.987)**	.4543* 0.3124 (9.24)**
governance1 (voice&acct)	INST1	0.2132* 1.211 (24.35)**	0.1909*	0.1554*	0.1566	0.1836	0.1602*	0.1395* 0.1463 (1.744)	0.1374* 0.0723*	0.1698* 0.129 (1.548)
governance2 (political stab)	INST2		0.989 (22.62)**					0.2588 (4.554)**	0.27897 (5.304)**	
governance3 (govt effectiveness)	INST3		0.483*	1.2887 (32.99)**				0.126* 0.5237 (3.431)**	0.1362* 0.4433 (4.204)**	
governance4 (regulatory quality)	INST4			0.7310*		1.3754 (33.97)**		0.2971* 0.6465 (5.154)**	0.2515 0.7371 (6.603)**	
governance5 (rule of law)	INST5					0.7163		0.3367* 1.2246 (32.59)**	0.3839* 0.0159 (0.0989)	
						0.6823*		0.0089*		1.0205 (9.684)** 0.569*



governance6 (corruption mitigation)	INST6						1.0533 (27.10)**	-0.0975 (-1.1654)		0.1575 (1.975)***
Year Dummies	D1	-0.00679 (-0.511)	-0.00902 (-0.654)	0.0159 (1.441)	-0.00255 (-0.2363)	-0.0043 (-0.3881)	0.0010 (0.084)	-0.0560*	0.00934 (0.895)	0.090*
Coefficient of Det	R <sup>2</sup>	82.83%	81.44%	88.21%	88.68	88.01%	84.81%	90.05%	89.94%	88.45%
Adjusted R <sup>2</sup>		82.66%	81.26%	88.09%	88.56	87.89%	84.66%	89.83%	89.80%	88.29%
F statistic		476.61	433.6	738.98	773.82	725.11	551.7	401.47	628.66	538.3996
Degrees of Fr		(5, 494)	(5,494)	(5, 494)	5, 494	(5, 494)	(5, 494)	(11, 488)	(7, 492)	(7, 492)
Significance for F, p-value		0.0000%	0.0000%	.00000%	.00000%	0.0000%	.00000%	.00000%	.00000%	0.0000%

\*\* 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

A single asterisk (\*) in the variable cells of all the Tables, showed beta weights<sup>14</sup>. Double asterisks (\*\*) indicated statistical significance at the 95% level. Individual coefficients in a statistically significant relationship were estimates of how much the dependent variable would change when the independent was changed by one unit, all other independent variables remaining unchanged. The coefficient of determination R<sup>2</sup> indicated how much variability in the dependent variable was explained by the independent variables in the equation.

These four measures advised of how critical the institutions were.

The measures of the beta weights throughout the first six models, showed that INST3 (government effectiveness) was the highest of all six institutions. INST3 had a beta weight of 0.7310. It was followed by INST4 (regulatory quality) at 0.7163, INST5 (the rule of law) was third at .6823, INST6 (corruption mitigation) at 0.6823, with INST1 (voice and accountability) and INST2 (political stability) showing the least impact.

The coefficients of the institutional variables showed that growth would change more per unit change of INST4 and INST3 than with a unit change in any of the other institutional variables.

The coefficients of determination (R<sup>2</sup>) and its adjusted version showed that INST4 and INST3 were higher than the others, given that the other independent variables controlled for were the same for each of the institutions.

What Table 1 indicated to us was that the two institutions INST3 and INST4 were the most critical on economic growth.

<sup>14</sup> Beta weights are used to assess the relative importance of the variability in each of the independent variables in the model, in helping to explain why the dependent variable varies through the population.

We further checked for the conformance of our models to OLS requirements, and we found a mixed bag. The Jarque-Bera non-normality test at 32.295% was quite good. Our Breusch-Pagan test at 0% was not so good, indicating some heteroskedastic variables. The Variance Inflation numbers for all the variables were within acceptable range of less than 10. The variance inflation would show how much an independent variable was influenced by another.

**Table 2: Life Expectancy at birth VS Institutional Measures and the Year Dummies.**

Variables		Model 10	Model 11	Model 12	Model 13	Model 14	Model 15
Intercept	$\beta_0$	2.9433 (19.48)**	2.835 (17.68)**	3.3164 (26.515)**	3.2531 (24.78)**	3.4172 (26.53)**	2.96555 (21.898)**
Ln Consumption	$X_1$	-0.0274 (-3.53)** -0.2812*	0.00298 (0.3883)	-0.00437 (-0.7179)	-0.0013 (-0.2031)	-0.00584 (-0.951)	-0.0023 (-0.3358)
Ln Gross Invstmts	$X_2$	0.8129 (6.12)** 0.1835*	0.0729 (5.004)** 0.1645*	0.0640 (5.862)** 0.1445*	0.06497 (5.652)** 0.1467*	0.0698 (4.156)** 0.1061*	0.0823 (6.812)** 0.1858*
Ln Govt Exp	$X_3$	0.0528 (6.805)** 0.5538*	0.04235 (5.363)** 0.4447*	0.0183 (2.844)** 0.1917*	0.0196 (2.918)** 0.206*	0.0250 (4.1563)** 0.1061*	0.0308 (4.325)** 0.3235*
Ln Exports	$X_4$	0.01146 (2.193)** 0.0640*	0.00987 (1.768)	-0.00192 (-0.4355)	-1.742 (-0.0038)	0.00228 (0.5179)	0.0014 (0.2826)
governance1 (voice&acct)	INST1	0.0926 (13.42)** 0.4705*					
governance2 (political stab)	INST2		0.0702 (10.96)** 0.3521*				
governance3 (govt effectiveness)	INST3			0.1186 (22.053)** 0.6913*			
governance4 (regulatory quality)	INST4				0.1196 (19.98)** 0.6401*		
governance5 (rule of law)	INST5					0.1152 (21.708)** 0.66*.	
governance6 (corruption mitigation)	INST6						0.0887 (17.014)** 0.523*
Year Dummies	D1	0.00675 (3.911)** 0.0982*	0.0066 (3.622)** 0.0953*	0.0093 (6.453)** 0.1352*	0.00747 (4.978)** 0.1086*	.00763 (5.287)** 0.1109*	0.00756 (4.712)** 0.1099*
Coefficient of R <sup>2</sup>		69.62%	66.65%	79.12%	77.08%	78.79%	73.86%
Adjusted R <sup>2</sup>		69.25%	66.24%	78.86%	76.80%	78.53%	73.55%
F statistic		188.25	164.18	311.307	276.273	305.252	232.215
Degrees of Freedom		(5, 493)	(6, 493)	(6, 493)	(6, 493)	(6, 493)	(6, 493)
Significance for F, p-value		0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%

\*\* 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

#### 4.1: Impact of the Institutions on Life Expectancy (table 2)

Using the Log of Life Expectancy for the various countries as a surrogate for comprehensive development, we employed equation one again in detecting the most critical institutions. The dependent variable was changed to the Log of life expectancy. Our findings are reported in Table 2.

The beta weights showed that INST3 (government effectiveness) was 0.6913, followed by INST5 (the rule of law) at 0.66, then INST4 (regulatory quality) at 0.6401. The position of INST1 and INST2 in these measures should not be a surprise.

Dictatorships and autocratic regimes, many a time, achieved both economic and developmental improvement for their people. In fact, it would seem that many coup d'états happened because somebody thought they could do better than an existing ineffectual government<sup>15</sup>.

The statistical coefficients showed a slightly higher value for INST4, at 0.1196, than for INST3 at 0.1186. The coefficients of determination were higher for INST3 than for the other institutions. In fact, INST5 (the rule of law) had a higher coefficient than INST4 (regulatory quality).

With our first surrogate for comprehensive development, INST3- government effectiveness- seemed most critical.

The analysis failed some of the OLS test, showing near zero normality and heteroscedasticity tests. The Durbin-Watson showed positive autocorrelation at 0.2945, and the variation inflation factor showed that government expenditures were influenced by some other independent variable

#### 4.2: Assessing the Impact of Institutions on Infant Mortality (Table 3)

The second test for comprehensive development was done with the log. of infant mortality, just as in the 2007 version. The results are shown in Table 3. Consider the beta weights. INST3 (government effectiveness) had a beta weight of -0.7663, negative because as would be expected, the institutions would be inversely related to infant mortality.

The next in order were INST5 (the rule of law) at -0.7222, and INST4 (regulatory quality) at -0.7045. INST6 (corruption) is 4<sup>th</sup>, INST1 and INST2 5<sup>th</sup> and 6<sup>th</sup>. The coefficient of Determination for INST3 was 87.37, higher than all the others.

With the infant mortality analysis, our residuals seemed to comply much better with OLS requirements. The heteroscedasticity test was very much improved for all the institutions, registering numbers very much above zero in all the cases. Same with the non-normality tests. The Durbin-Watson, though not as close to 2 as would be required, was above zero in all cases.

The variance inflation numbers, indicating some dependence existed for some GDP components were above the acceptable number of 10. This did not seem to be unusual, since government expenditures, and consumption figures could influence one another in many areas, such as taxes, transfer payments and the like.

What one continued to observe in these analyses was the superiority of INST3, government effectiveness, as an institution critical to both economic health and comprehensive development.

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<sup>15</sup> De Hann and Siermann (1996)

**Table 3:** Infant Mortality VS Institutional Measures, and the Year Dummies.

Variables		Model 16	Model 17	Model 18	Model 19	Model 20	Model 21
Intercept	$\beta_0$	8.399 (9.0663)**	8.1734 (8.616)**	5.6158 (8.3826)**	6.1752 (8.3147)**	4.9973 (7.0184)**	8.1525 (10.412)**
Ln Consumption	$X_1$	0.19404 (4.0796)**	-0.0349 (-0.7696)	0.0162 (.4955)	-0.0078 (-0.2168)	0.0261 (0.7692)	0.001505 (0.0382)
Ln Gross Invstmts	$X_2$	0.289* -0.1525 (-1.872)	-0.0521 -0.00669 (-0.0777)	0.0241* -0.02456 (-0.4199)	-0.116* -0.0364 (-0.5592)	0.0389* 0.0958 (1.5323)	0.0022* -0.15585 (-2.2313)**
Ln Govt Exp	$X_3$	-0.0500* -0.3897 (-8.1995)**	-0.0022* -0.31498 (-6.617)**	-0.008* -0.1254 (-3.648)**	-0.0119* -0.1368 (-3.598)**	0.0314* -0.1784 (-5.0141)**	-0.0511* 0.2204 (-5.3496)**
Ln Exports	$X_4$	-0.5941* -0.1882 (-5.872)**	-0.4802* -0.1541 (-4.666)**	-0.1912* -0.0871 (-3.675)**	-0.2086* -0.01032 (-3.943)**	-0.2719 -0.1218 (-5.005)**	0.3359* -0.10877 (-3.788)**
governance1 (voice&acct)	INST1	-0.1525 -0.7132 (-16.847)**	-0.1249*	-0.0706*	-0.0837*	-0.0988*	-0.0882*
governance2 (political stab)	INST2		-0.6191 (-16.35)**				
governance3 (govt effectiveness)	INST3		-0.4511*	-0.9055 (-31.44)**			
governance4 (regulatory quality)	INST4			-0.7663*	-0.9067 (-26.767)**		
governance5 (rule of law)	INST5				-0.7045*	-0.8689 (-29.59)**	
governance6 (corruption mitigation)	INST6					-0.7222*	-0.6893 (-22.86)**
Year Dummies	D1	-0.01888 (-1.783)	-0.01946 (-1.817)	-0.0382 (-4.948)**	-0.0241 (-2.8348)**	-0.0252 (-3.154)**	-0.0253 (-2.726)**
Coefficient of Determination	$R^2$	-0.0398* 75.92%	-0.0411* 75.40%	-0.0806* 87.37%	-0.051* 84.53%	-0.0531* 86.33%	-0.0534* 81.58%
Adjusted R <sup>2</sup>		75.63%	75.10%	87.22%	84.35%	86.17%	81.36%
F statistic		259.05	251.792	568.5884	449.1	519.087	363.94
Degrees of Freedom		(6, 493)	(6, 493)	(6, 493)	(6, 493)	(6, 493)	(6, 493)
Significance for F, p-value		0.0000%	0.0000%	0.000%	0.000%	0.000%	0.0000%

\*\* 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

### 4.3: Africa Infant Mortality Analysis (Table 4)

We explored the impact of the institutions on African development. Our results are recorded in Table 4 below. There had been some improvement over the years in infant mortality in the African countries. The

same trend that held for the entire group in Tables 1, 2 and 3, also held at table 4, for Africa, South of the Sahara. Effective government (INST3) was the institution of choice, outperforming the rest of them. INST3 is the most critical, followed by INST5 (the rule of law) and INST6 (corruption mitigation). The one noticeable difference is that the coefficients of determination were markedly low. The highest was with INST3 at 56.38%. The residual test for OLS requirements was not met in all cases.

**Table 4:** Africa Alone (29 Sub-Sahara African Countries)  
 Infant Mortality Measures VS Institutions, GDP components and the Year Dummies.

Variables		Model 22	Model 23	Model 24	Model 25	Model 26	Model 27
Intercept	$\beta_0$	6.8226 (11.47)**	6.6585 (10.4)**	4.4584 (8.402)**	6.0215 (10.42)**	4.8323 (8.863)**	6.9478 (11.422)**
Ln Consumption Exp.		-0.0252 (-0.8273)	-0.0617 (-2.055)**	0.0268 (1.058)	-0.0424 (-1.5204)	-0.0224 (-0.882)	-0.052 (-1.73)
Ln. Gross Investments		-0.0793* (-4.602)**	-0.1944* (-3.182)**	0.0845* (-0.8490)	-0.1337* (-3.27)**	-0.0707* (-0.638)	-0.1639* (-4.146)**
Ln Govt. Expenditures		-0.2294 (-0.3393)	-0.1798 (-0.0506)	-0.0376 (-0.2464)	-0.1591 (1.1928)	-0.03007 (-0.1963)	-0.2176 (0.3832)
Ln. Exports		-0.0327* (0.2376)	-0.0050* (0.082)	-0.0192* (-1.3331)	0.1056 (-0.6075)	-0.0159* (-1.1618)	0.0369* (-0.5921)
governance1 (voice&acct)	INST1	0.0120* (-7.212)**	0.0042* (-0.3827* -0.1610)	-0.0554* (-14.397)**	-0.0289* (-0.6979* -0.4712)	0.0502* (-9.562)**	-0.0303* (-0.3555* -0.2128)
governance2 (political stab)	INST2		-0.1610 (-6.167)**				
governance3 (govt effectiveness)	INST3			-0.4712 (-14.397)**			
governance4 (regulatory quality)	INST4				-0.3218 (-9.562)**		
governance5 (rule of law)	INST5					-0.39898 (-13.10)**	
governance6 (corruption)	INST6					0.6518*	-0.2128 (-6.4351)**
Year Dummies	D1	-0.03112 (-4.585)**	-0.0308 (-4.436)**	-0.0394 (-6.971)**	-0.03229 (-5.027)**	-0.034 (-5.829)**	-0.032 (-4.637)**
Coefficient of R <sup>2</sup>		-0.3827* 36.16%	-0.2177* 33.38%	-0.2788* 56.38%	-0.2286* 42.88%		-0.2267* 34.07%
Determination							
Adjusted R <sup>2</sup>	Adj.R <sup>2</sup>	34.81%	31.97%	55.45%	41.67%	51.96%	32.68%
F statistic		26.715	23.63	60.96	35.408	53.1	24.38
Degrees of Fr		(6, 283)	(6, 283)	(6, 283)	(6, 283)	(6, 283)	(6,283)
Significance for F, p-value		0.0000%	0.0000%	0.000%	0.0000%	0.000%	0.0000%

\*\* 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

Models 22-25 use Mortality vs. Inst3, Inst4, Inst5, Inst6; Models 26-29, are the same as 22-25, except that GDP/Capita Growth is the dependent variable. Capital stock and Total Factor Productivity are controlled for. Differencing of the variables is employed.

**Table 5:** Using differences for development and growth vs. selected institutions and the year dummies.

Variables		Model 22 Mortality	Model 23 Mortality	Model 24 Mortality	Model 25 Mortality	Model 26 GDP/Cap	Model 27 GDP/Cap	Model 28 GDP/Cap	Model 29 GDP/Cap
intercept	B0	-5.3478 (-10.68)**	-5.241 (-10.42)	-5.425 (-10.85)	-5.026 (-9.887)**	-0.6488 (-1.15)	-0.5152 (-0.91)	-0.647 (-1.15)**	-0.5956 (-1.0237)
governance3 (govt effectiveness)	X3	-2.993 (-2.089)**				-1.175 (-0.725)			
governance4 (regulatory quality)	X4		-4.016 (-2.63)**				-3.081 (-1.729)		
governance5 (rule of law)	X5			-2.64 (-1.414)				-2.4006 (-1.14)	
governance6 (corruption mitigation)	X6				-4.428 (-3.448)**				-1.0362 (-0.705)
TPF	X7	-4.0374 (-0.716)	-3.295 (-0.584)	-4.38 (-0.773)	-5.1345 (-0.925)	82.431 (12.91)**	83.435 (13.08)**	82.72 (12.97)**	81.99 (12.91)**
Capital Stock	X8	-0.0355* (0.0107)	-0.029* (0.0554)	-0.0385 (-0.0450)	-0.0451* (-0.0348)	0.5952* (-2.135)**	0.6024* (-2.10)**	0.597* (-2.17)**	0.5920* (-2.15)**
Year Dummies	D1	0.0005 (9.29)**	0.0027* (9.075)**	-0.0022* (9.613)**	-0.0017 (8.426)*	-0.098* (1.253)	0.096* (0.998)*	-0.099* (1.295)	0.0986* (1.126)
Coeff of Determinatn	R <sup>2</sup>	24.22%	24.81%	23.67%	25.95%	34.58%	35.12%	34.74%	34.58
Adjusted R <sup>2</sup>	Adj. R <sup>2</sup>	23.27%	23.87%	22.71%	25.02%	33.76%	34.31%	33.92%	33.75%
F statistic		25.49	26.32	24.73	27.94	42.157	43.17	42.45	42.15
Degrees of Fr		(4, 319)	(4, 319)	(4, 319)	(4, 319)	(4, 319)	(4, 319)	(4, 319)	(4, 319)
Significance for F, p-value		0.0000%	0.0000%	0.000%	0.0000%	0.0000%	0.0000%	0.0000%	.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. \*\*\* significant at 90% level

#### 4.4 The impact of institutions on growth per capita, on Life expectancy and on Infant Mortality (using differencing) [Tables 5 and 6]

We used different variables and a different model formulation to produce the analysis reported in Table 5. Differencing was used, to avoid some of the unaccounted for the variable effect that might have existed in our other formulations. The two independent variables added to the institutions were capital stock and total factor productivity (TPF). We tested for the most critical institution using GDP/Capita and Infant Mortality. First without log transforms, and the results are on table 5. Secondly, we differenced the log of all the dependent and independent variables, with the exception of the institutions. We report the results of the log-linear transforms on table-6.

**Table 6:** Using Log Differences for Dependent Development and Growth vs. Selected Institutions

Variables		Model 31 Mortality	Model 32 Mortality	Model 33 Mortality	Model 34 Mortality	Model 35 Mortality	Model 36 Mortality	Model 37 GDP/Cap	Model38 GDP/Cap Model	Model39 GDP/Cap	Model40 GDP/Cap
intercept	$\beta_0$	-0.055 (-7.6)**	-0.0595 (-7.1)**	0.0625 (-9.9)**	-0.0567 (-8.1)**	-0.054 (-8.8)**	-0.0609 (-8.6)**	0.00303 (0.7284)	-0.00075 (-0.17)	-0.00279 (-0.8)**	0.00192 (0.3855)
Governance 1 (Voice & Accountability)	INST1 (X1)	-0.5874 (-12)** -0.34*									
Governance 2 (Political Stability)	INST2 (X2)		-0.1841 (-5.1)** -0.1630								
governance3 (government effectiveness)	INST3 (X3)			-0.6512 (-17.5)** -0.4101*				0.4168 (16.9)** 0.2188*			
governance4 (regulatory quality)	INST4 (X4)				-0.6788 (-13.1)** -0.3527*				0.4569 (14.1)**		
governance5 (rule of law)	INST5 (X5)					-0.759 (-18.6)** -0.4257*				0.5452 (23.4)** 0.2549*	
governance6 (corruption mitigation)	INST6 (X6)						-0.5732 (-13)** -0.3398*				0.3104 (10.02)** 0.1534*
LN TPF	Ln X7	-0.2487 (-0.9928)	-0.5192 (-1.784)	-0.0810 (-0.37)**	-0.0927 (-0.3766)	0.06223 (0.2909)	-0.4438 (-1.809)	1.1437 (7.901)**	1.1304 (7.197)**	0.9909 (8.10)**	1.403 (8.189)**
		-0.0264	-0.0552*	-0.0086*	-0.0099*	0.0066**	-0.0472*	0.1013*	0.1002*	.0878*	0.124*
LN Capital Stock	Ln X8	0.345894 (26.64)**	0.3648 (23.91)**	0.3656 (33.12)**	0.3635 (29.37)**	0.365 (34.12)**	0.365 (29.18)**	0.549 (75.41)**	0.5512 (69.8)**	0.5512 (90.08)**	0.5473 (62.66)**

		.7250*	0.7646	0.7663	0.7620*	0.7652	0.7652*	0.9595	0.963	0.9631	0.9564*
Year Dummies	D1										
Coefficient of Determination	R <sup>2</sup>	76.73%	68.47%	82.25%	77.85%	83.32%	77.33%	94.63%	93.73%	96.21%	92.32%
Adjusted R <sup>2</sup>	Adj. R <sup>2</sup>	76.52%	68.19%	82.09%	77.65%	83.17%	77.13%	94.58%	93.68%	96.17%	92.25%
F statistic		369.36	243.27	518.87	393.61	559.3	382.1	1973.32	1675.05	2840.86	1347.3
Degrees of Fr		(3, 336)	(3,336)	(3,336)	(3, 336)	(3, 336)	(3, 336)	(3, 336)	(3, 336)	(3, 336)	(3, 336)
Significance for F, p-value		0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
** 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											

Since our prior analyses, reported in Tables 1 through 4, clearly indicated that two institutions, voice, and accountability and political stability were not the most critical about growth or comprehensive development, we chose to evaluate the other four when we applied both differencing and the log of differencing. We would now go ahead and report the findings with INST3, INST4, INST5 and INST6. We also dispensed with Life Expectancy and used only Infant Mortality and its log in the analyses reported in Tables 5 and 6.

The linear-linear OLS analyses, reported in Table 5, showed a significant relationship between the institutions and comprehensive development even when capital stock and total factor productivity were controlled for. The four institutions, except the rule of law, were significant. Corruption (INST6) was the most relevant, with Regulatory Quality (INST4) coming in second. Government Effectiveness was 3<sup>rd</sup> in importance. The measurements were the beta weights and the coefficients of determination. When GDP/Capita Growth was measured against the institutions, controlling for the capital stock and TPF, none of the institutions showed any significance. The controlled for variables showed substantial significance with growth. In all these cases, the coefficients of determination were quite low, ranging from 22% to 34%.

On Table 6, log-log analyses were used, and the significance and coefficients of determination were quite impressive, reaching (in the case of coefficients of determination), 96%, when the rule of law (INST5) was regressed against GDP/Capita growth, and capital stock, controlling for TPF. INST3 (government effectiveness) and INST5 (the rule of law) seemed to be the most critical intuitions with comprehensive development as well as GDP/Capita growth. In both cases, INST5 was slightly better than INST3.



## 5.0 CONCLUSION

Government Effectiveness (INST<sub>3</sub>) demonstrated a clear pattern of superiority in impact on growth and comprehensive development. About growth, INST<sub>3</sub> showed the highest impact when we used the linear-linear fixed effect model, (both differenced and non-differenced). When tested against infant mortality, even with Sub-Sahara African data alone, INST<sub>3</sub> showed the most impact. In a log-linear and log-log analysis, INST<sub>3</sub> was also superior, except that INST<sub>5</sub> showed a slightly higher level of importance in the case of log-log differenced models (Table 6). Even then INST<sub>3</sub> came in a very close second.

We came to the conclusion early that INST<sub>1</sub> (Voice and accountability) and INST<sub>2</sub> (Political Stability) were not as critical as the other four institutions. Different institutions could have different impacts, depending on whether growth or comprehensive development is the focus. Government Effectiveness was the most critical institution, followed by the Rule of Law. Government Effectiveness was critical in growth. Its superiority was in comprehensive development. Regarding policy priorities, governments, especially in developing parts of the world, would be well advised to channel their efforts and resources toward improving two institutions, government effectiveness (the civil service) and the rule of law. These two institutions, especially the civil service, have the capacity to improve the lives of the people, in addition to possibly dragging along the other institutions with them. Governments and policymakers in developing countries should pay close attention.

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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