

INSTITUTIONS AND INFRASTRUCTURE

By

Ndiershey, Funwie Prosper

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
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ABSTRACT

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This work starts with an overview of studies that address institutions and or infrastructure concurrently or separately. Using country-level measures of institutional quality and infrastructure from The World Bank's World Development Index (WDI) dataset, to assess the extent to which democracy and the quality of public service delivery eventually lead to a higher quality in tangible infrastructure like road network and access to electricity. Using panel data spanning 142 countries over a time bracket of 14 years, results show that better institutional quality significantly improves the quality of infrastructure. On the other hand, the level of democracy of countries did not significantly affect the quality of their infrastructure. This reaffirms prior findings that the quality of government service delivery outperforms democracy in ramping up the performance of countries; it also reinforces earlier work that suggests that institutions stand as the infrastructure of democracy.

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Dedicated to my late Dad

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INTRODUCTION

The common approach in tackling the debate on the factors that affect economic growth usually tilts toward the traditional perspective such as levels of infrastructure, human capital and development technology (Economics Help). Whereas these factors certainly affect economic growth, “the empirical literature has previously emphasized the role of economic determinants, financial and monetary explanations of financial instability” (as cited in Ati & Ben 2013). Not much has been done as of now to capture the importance of road infrastructure in propagating development; for example, establishing a cause-effect relationship between road infrastructure and development.

Some amount of literature covers the increase speed and ease of development with Information and Communications Technology, ICT (T. T .Sreekumar 2011). While development can be gauged in many different ways, infrastructural quality usually stands out prominently; it is observable that developed countries have better infrastructure than poorer nations and do enjoy greater degrees of freedom and overall transparency than the latter (Andrew Williams). Aside from freedom and transparency, high income countries also have better service delivery pound for pound both at the public and private sector.

A myriad of publications have been made over the past years addressing the importance of institutional quality on several indicators affecting development. According to (Dani Rodrik, 1999), it is generally accepted that institutional quality comprises of openness (meaning the absence of a selection bias), Social variables like inequality and ethnic diversity do not play a role in institutional quality and specific features of institutions like press freedom and transparency positively tie to overall perceptions of institutional quality.

LITERATURE REVIEW

Institutional quality at first glance feels like the bedrock or the condition for success for all other country-level aspirations. It would be therefore futile to talk about institutional quality without mentioning what actually qualifies an institution as better than another. According to Alonso and Garcimartin, 2010, the higher the level of development, the soundness of the tax system, and the conditions of income distribution the stronger the pointers on institutional quality; education on the other hand is said to improve institutional quality. This does not suggest any cause-effect relationship between institutional quality and any form of development. What about the effects of corruption and bad governance on the economy.

Whilst economic underperformance has long been attributed to corruption, as key variable, exonerating other variables like poor governance as trivial; theoretically, institutional quality should reflect the levels of corruption and the sanity of governance among other variables. This implies that economic success has to come with the extinction of both corruption and bad governance simultaneously; eliminating one and not the other would not amount to any progress (Molinari M). Given that bad governance and corruption are usually rampant in countries that experience financial stress, there is need to see what role institutional quality plays with respect to the financial stress of emerging countries.

As measured by the financial stress index, it should be taken to mean financial instability. An improvement in the facets of institutional quality like the rule of law, government effectiveness, regulatory quality, political stability, anti-violence and accountability will lead to a relieve of financial tensions and thus, the stabilization of financial markets (Abdessatar & Rachida). Using a recently developed estimate by the government (as cited in Kaufman, 2012); a sample data of

27 emerging countries between 1996 and 2011, panel was used. Interestingly, financial stability does not necessarily mean infrastructural improvement or real growth; but it will not be surprising though, to see a correlation between financial stability and economic development.

In a similar attempt as that of measuring financial stress index above, but in this case focusing on Latin American countries' economic volatility and institutional quality, Whitford S. M. in 2014 established that institutional quality has a positive impact on economic growth and a significant negative impact on economic volatility (volatility here is represented by inflationary levels). Unfortunately, this paper does place infrastructural development at the center of economic development. The relevance of institutional quality doesn't stop at economic volatility, but has also been proven to have a significant effect on innovative capacity of a society.

Measuring the innovative capacity of a society is hard to do, but by using a proxy like the number of patents produced in a society, we can establish the level of innovativeness that the said society wields. Institutional arrangements could be key to explain cross-country variations in patent holdings (Tebaldi & Elmslie, 2008). Instrumental Variables and Generalized Methods of Movements (IV-GMM) and Ordinary Least Squares (OLS) via cross-country regressions with the number of patents standing as the dependent variable (Y) were applied. Although long run human capital accumulation could profoundly affect the quality of institutions, this improved quality might matter even more when considered in view of the size of the state.

The size of a state here could be interpreted as the ratio of government spending to Gross Domestic Product (GDP) of a country. Findings unexpectedly show an inverse relationship between the size of the state and institutional quality; this implies that better institutional quality will lead to a better extent of governance in smaller-size states as opposed to bigger-size states

(Bagdigen & Dokmen, 2012). This paper focused on advanced economies' static and dynamic panel data analysis between 1984 and 2007. The results showed that a smaller more efficient state would be the type of state that knows exactly where intervention is relevant and where interference might prove futile. One question that might pop up could be whether the reason for general low performance of aid effectiveness can be attributed to the presence of big states in aid-recipient countries?

Aid effectiveness when directed to states, whether in the form of grants, loans, scholarships or knowhow has been a major call for concern in the past decades as there has been a significant magnitude of failure across the board. Institutions are doubtlessly often weak in aid-recipient nations given that there is a strong correlation between economic development and institutional quality as stated earlier. In this regard, aid should be preceded by assistance in institutional building to enhance the aid effectiveness capacity of recipient countries (Asongu S. A, 2013). This is an indication of a cause-effect relation between institutional quality and capacity for economic growth; yet there is no inclusion of infrastructural development.

The data here is from the U.S.A's imports classified by 4-digit Standard Industrial Classification (SIC), 1998 containing figures for 177 countries and 389 industries. Here, the dependent variable is the trade share of the country divided by the average share of the country in the U.S. imports. It is worth noting that infrastructural development is usually assumed as given with economic expansion probably because it is simply seen as a subset of major long-term economic growth strides like human capacity development.

Spending in education is enhancing the kind of human capacity that can enhance and sustain durable growth for the future. This growth will certainly translate into better infrastructural

quality. This increased human capacity via education would lead to the accumulation of human capital stocks which might lead to improved institutional functionality and thence, a proper utilization of policies like trade liberalization (Mamoon, Dawood and Murshed, Mansoob, 2007). The data here includes both poor countries and wealthy OECD countries. A possible question here would be, is this investment in human capital equitable, regionally balanced and consistent across all demographic settings? If not, what would be the consequences on wage inequality between skilled and unskilled workers?

Institutional quality improvement has the ability to impact interest rates, in turn; interest rate combined with capital intensity will provoke an impact on the skilled-unskilled wage balance (Pi & Zhou, 2013). Capital intensity here could be extensive if there is minimum infrastructure in place. It would be rational for this minimum infrastructure to be in place so as to absorb the invested capital.

Talking about investment of capital without mentioning Foreign Direct Investments (FDI) would be an oversight given that there is a lot of evidence that FDIs have a positive effect on economic growth. Noting that some countries certainly get more FDI than others, there should be an underlying reason for things to be this way. Although, infrastructural quality and other traditional aspects that invite foreign investors are strong, the quality of domestic institutions as a pulling factor for Multinational National Corporations (MNCs) cannot be neglected as a prime-determining factor of the amount of FDI a country receives (Yin-li, Azman-Saini and Siong-Hook, 2012). Of course, this does not imply that the quality of the domestic country's institutional setup can exist independent of the more traditional boosters of FDIs.

A minimum level of infrastructural development is certainly needed for more FDI to happen because most MNCs are export oriented in nature and will need to export manufactured products to other markets. This implies that in some way, institutional quality has an indirectly strong influence on international trade. Institutional differences though subtle, are an important determinant of trade flows (Levchenko, 2007). For institutional differences to truly affect trade flows, intellectual property rights will have to have an important part to play.

Investing in Research and Development (R&D) is one activity that gives firms comparative advantage vis-à-vis each other and proper institutions that protect Intellectual Property Rights (IPRs) can lead to more FDIs and hence, quicker economic growth. Studies show that strong IPRs stimulate growth for some time until it gets to a point where IPR enforcement decreases in institutional quality (Davis & Sener, 2011). Though enforcement strangely plummets with higher institutional quality according to the aforementioned research, overall growth of the domestic country might not be greatly harmed.

In his 2006 paper, *The Link between Institutional Quality and Economic Growth*, Andrew Williams highlights the fact that though there is clear evidence of a link between both; there is unfortunately neither a causal relationship nor any clearly established transmission mechanism between both. While these shortfalls remain unresolved, other ways in which institutional quality affects the stability of economies have been probed into.

METHODOLOGY

The empirical task of this study attempts to answer two questions:

- (i) How and to what extent does institutional quality impact infrastructure?
- (ii) If yes, could improving the quality of institutions solely, be a proxy for infrastructural development?

To quantitatively address the aforementioned questions, a panel data of 142 countries spanning a time bracket from 2000 to 2013 was used. The dependent variables here, percentage of roads paved (pave) and access to electricity (elec) are tested against three independent variables quality of government service delivery (quality), measures of state democracy (demo) and GDP per capita are used in this work.

For the dependent variables, percentages of roads paved represent the measured amount of tangible infrastructure in a country. This could be understood as an honest indication of tangible infrastructural development that might not be greatly impacted by external influences like globalization and migration, but could be impacted by the economic performance and institutional organization within a country as this leads to greater attraction for capital investment.

The aforementioned logic also applies to the access to electricity as more people gain access to electricity if there is adequate communication of needs from the civil society to the authority in place (thus, transparent and solid institutions should reinforce the quality of infrastructure within the jurisdiction of the institution). Good to mention here that the suggested negligibility of globalization mentioned above was further affirmed in the WTO (Renato Ruggiero, 1996) – here, foreign direct investment is said to be a motor to globalization and not the other way round

The third dependent variable here is Gross Capital Formation (GCF). Gross capital formation accounts for the net additions to the physical capital stock; this makes gross capital formation a more realistic measure of growth as opposed to GDP per capita as GDP per capita is impacted by sharp increases or decrease in population (World Bank data). Gross capital formation also encompasses the net accumulation of valuables like machinery and equipment, land development like fences and drains, and the overall changes in inventories (SNA, 1993).

The independent variables used here are GDP growth (annual), measures of state democracy (demo) and the quality of public service delivery (quality). Inspired by (Helliwell, Huang, Grover, Wang, 2014): -A measure of democracy is gotten from an average of voice and accountability, plus political stability and the absence of violence; -The quality of public service delivery is an average of four variables, government effectiveness, regulatory quality, rule of law and the control of corruption.

The data in this work is sourced from the International Country Risk Guide (ICRG). The data here is provided by Political Risk Services and is based on expert assessment subject to peer review at the topic and regional levels. The ICRG data consists of political Risk Index comprising of 12 components measuring various dimensions, which include the political, and business environment faced by firms operating within a country. This data is collected monthly, but only data for December each year is used here; the maximum value is 1 and the minimum is 0.

Voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality and the rule of law are the parameters invoked. Whereas, voice and accountability captures the ability of citizens to select their government, a free media with

freedom of expression and association; political stability and absence of violence reflects the potentials of political instability erupting. They are both included here because they represent key freedoms that indicate how democratic or undemocratic a country is and how the people within the said country feel about their levels of freedom.

Government effectiveness handles discernments of the quality of public service delivery without political pressure and policy formulation and implementation highlighting government commitment to her policies; this is relevant to this research in that the quality of service delivery could be a proxy for efficiency and efficacy of a government. Regulatory quality of contract enforcement, property rights, judiciary system and the citizens' confidence level in the sanity of these processes; these are all relevant here because the absence of a legal system that is trust worthy will only lead to less investment and reduced quality. Control of corruption probes into the extent to which public power is directed to enhance private gain, thus corruption levels at all levels. Too much corruption usually leads to a misallocation and inefficiency in government at all levels (Daniel J. Mitchell, 2005). For the statistical analysis of the aforementioned variables, see Table1 below.

Table1 Summary Statistics of Main Independent Variables

	Mean	Standard Deviation	Observations
	(1)	(2)	(3)
Levels of Democracy (demo)	0.69	0.16	1807
Quality of public service delivery	0.57	0.20	1807

(Rem: levels of democracy should include the range of measurement (percentages or from 0 to 1; same with quality of public service delivery). – include source of data.

From the World Bank's World Development Index, GDP growth annual (gdpa), percentage of roads paved, percentage of population with access to electricity, gross capital formation as a

percentage of GDP, foreign direct investment (FDI), and inflation (consumer prices annual percentage). Also, seven regional dummies were formulated based on the World Bank's division, Sub-Saharan Africa (SSA), Latin America and the Caribbean (LACAR), Europe and Central Asia (EUCA), South Asia (SA), North America (NA), East Asia Pacific (EAP), and Middle-East and North Africa (MENA). For more details on the number of observations, mean, standard deviation, maximum and minimum values see Table2 below.

Table1 Summary Statistics of Dependent and Control Variables.

Variables	Mean	Standard Deviation	Observations
	(1)	(2)	(3)
Percentage of Roads paved out of as a fraction of total road network	55.13	32.34	802
Percentage of the population with access to electricity	77.89	31.07	290
Gross capital formation per annum	22.84	6.99	1836
Foreign direct investment as a percentage of GDP	5.09	12.47	1853
Inflation level	9.26	62.17	1891

Two control variables were gotten from the World Bank; they are included to reduce the variance of the error term and reduce endogeneity, these variables include Foreign Direct Investment (FDI) and Inflation both as a percentage of GDP. The basic model with regional dummies represented by D_{it} and μ_{it} representing the error term goes thus:

For percentage of roads paved as dependent variable, we get:

$$\text{pave}_{it} = \beta_0 + \beta_1 \text{demo}_{it} + \beta_2 \text{quality}_{it} + \beta_3 \text{gdpa}_{it} + \beta_4 \text{fdi}_{it} + \beta_5 \text{inf}_{it} + \beta_6 D_{it} + \mu_{it} \dots \dots \dots (1)$$

For percentage of population with access to electricity, we get:

$$\text{elec}_{it} = \beta_0 + \beta_1 \text{demo}_{it} + \beta_2 \text{quality}_{it} + \beta_3 \text{gdpa}_{it} + \beta_4 \text{fdi}_{it} + \beta_5 \text{inf}_{it} + \beta_6 D_{it} + \mu_{it} \dots \dots \dots (2)$$

For gross capital formation, we get:

$$\text{gcf}_{it} = \beta_0 + \beta_1 \text{demo}_{it} + \beta_2 \text{quality}_{it} + \beta_3 \text{gdpa}_{it} + \beta_4 \text{fdi}_{it} + \beta_5 \text{inf}_{it} + \beta_6 D_{it} + \mu_{it} \dots \dots \dots (3)$$

The hypothesis underpinning this work expects institutions to have a significant impact on infrastructure.

The null hypothesis (H_0) being better institutions do not have a significant improvement on the quality of infrastructure in a country.

The alternative hypothesis (H_1) postulates that better institutions do significantly improve the quality of infrastructure in a country.

H_1 : better institutions do not significantly improve the quality of infrastructure

H_0 : better institutions significantly improve the quality of infrastructure

EMPIRICAL RESULTS

The Dependent Variables are Percentage of Roads Paved (pave), Access to Electricity (elec) and Gross Capital Formation Respectively.

Table 2 Regression Results Regression Results

	Percentage of roads Paved (1)	Percentage of population with access to electricity (2)	Gross capital formation (3)
GDP growth	-0.244	0.659	0.381***
Per annum	(-1.05)	(1.49)	(5.91)
Levels of	-7.318	-1.043	4.587*
Democracy	(-0.96)	(-0.10)	(2.31)
Quality of Public	18.25*	23.28*	-3.418*
Service delivery	(2.20)	(2.44)	(-2.46)
Foreign direct	0.223	-0.0299	0.0234
Investment	(1.39)	(-1.93)	(0.84)
Inflation levels	-0.00622	0.00207	-0.000418
	(-0.28)	(0.74)	(-0.44)
East Asia	7.629*	-9.433*	3.970***
Pacific dummy	(2.29)	(-2.44)	(6.06)
Sub-Saharan	-39.41***	-59.73***	-2.905***

Africa Dummy	(-10.78)	(-12.26)	(-3.90)
Latin America	-32.99***	-2.587	-1.540*
And the Caribbean Dummy	(-9.07)	(-0.76)	(-2.46)
Europe and Central Asia Dummy	15.94*** (4.89)	4.184* (2.13)	0.991* (2.83)
South Asia Dummy	-2.311 (-0.45)	-21.43** (-3.04)	2.657** (2.83)
Middle East and North Africa Dummy	14.20*** (3.99)	0.107 (0.03)	1.528* (2.19)
2001. Year	-0.0423 (-0.01)	12.91*** (4.78)	0.388 (0.57)
2002. Year	2.253 (0.63)	10.98*** (5.08)	0.0323 (0.05)
2003. Year	4.511 (1.33)	12.11*** (4.77)	0.458 (0.66)
2004. Year	2.472 (0.76)	9.687*** (4.47)	0.408 (0.53)
2005. Year	2.317 (0.63)	11.24*** (5.03)	1.254 (1.75)
2006. Year	3.855 (1.12)	11.32*** (5.04)	1.750* (2.35)

2007. Year	2.140 (0.63)	9.530*** (4.29)	2.977*** (3.86)
2008. Year	2.882 (0.87)	9.191*** (4.48)	4.490*** (5.75)
2009. Year	3.738 (1.08)	13.52*** (4.51)	3.141*** (3.75)
2010. Year	5.021 (1.41)	3.054 (1.60)	1.833* (2.46)
2011. Year	4.639 (1.25)	9.884*** (4.83)	2.226** (2.87)
2013. Year		11.77*** (5.23)	1.812* (2.24)
_cons	49.90*** (8.83)	76.64*** (8.90)	18.95*** (13.90)
N	772	272	1657

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

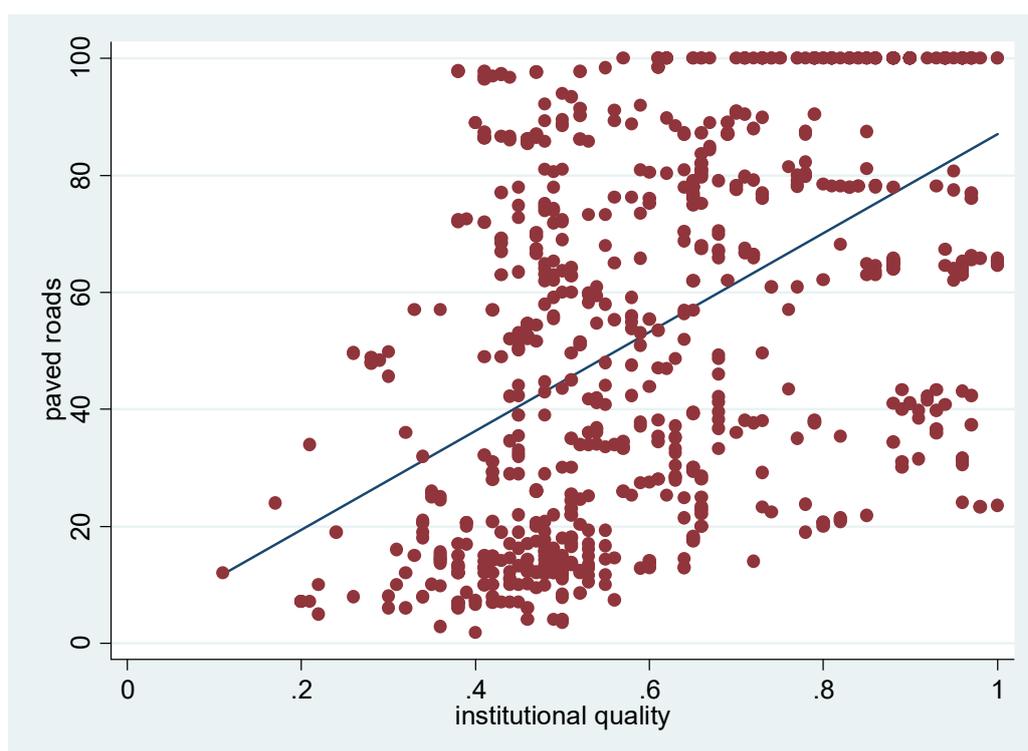
Note: The quantities in brackets under the estimates are the standard errors. Significance levels are indicated by ***, **, * for 1, 5, 10 percent respectively. *gdpa* represents GDP growth (annual), *demo* = level of democracy, *quality* = quality of public service delivery, *fdi* = foreign direct investment (% of GDP), *inf* = inflation (consumer price annual %). The regional dummies include *eap* = East Asia Pacific, *ssadummy* = Sub-Saharan Africa, *lacardummy* = Latin America and the Carribean, *euca* = Europe and Central Asia, *sadummy* = South Asia, *mena* = Middle East and North Africa.

Equations (1), (2) and (3) represent regressions (1), (2) and (3) respectively; these regressions are also in order respectively from percentage of roads paved, percentage of population with access to electricity and gross capital formation (*pave*, *elec* and *gcf*).

In the first regression with percentage of roads paved (*pave*) as the dependent variable percentage of roads paved is significantly influenced by the quality of institutions at 5%. Thus, a one point increase in the quality of public service delivery leads to an 18.25% increase in the

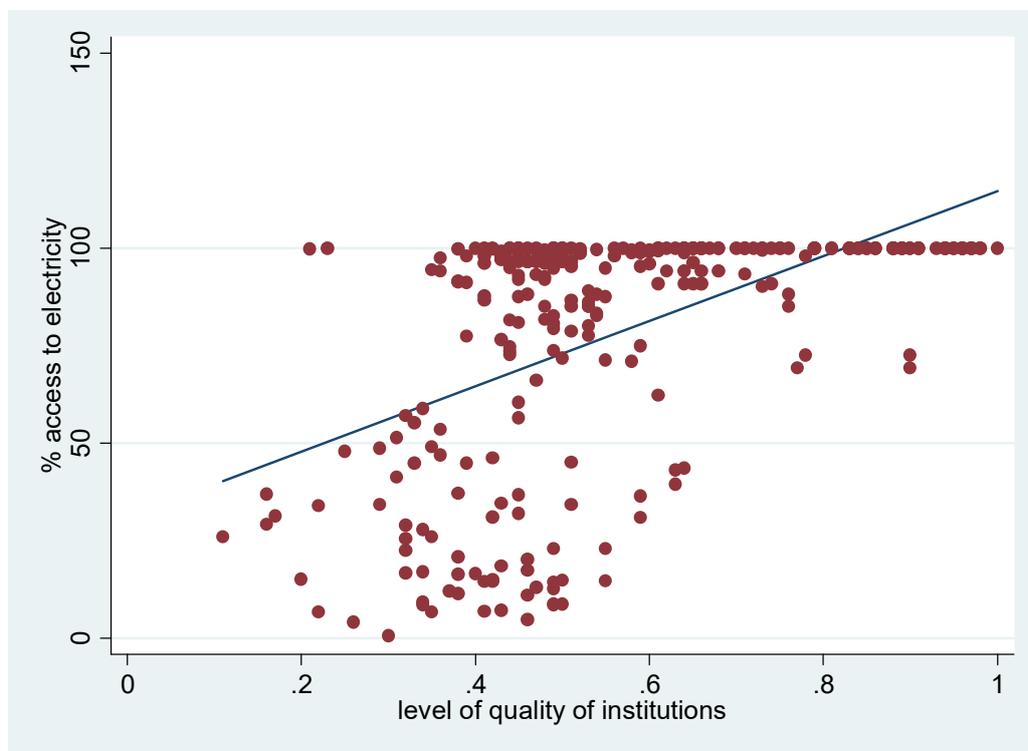
number of roads paved. Based on the outcome, there is no significance in the relationship between levels of democracy and the percentage of total roads paved. The scatter plot on fig1 below confirms this positive relationship.

Figure1 Scatter Plot of Paved Versus Institutional Quality (level of democracy).



Equation (2) has access to electricity as the dependent variable and from the results, yet again, there is no significant impact in the relation between democratic levels and the percentage of the population with access to electricity. On the other hand, the relationship between access to electricity and the quality of public service delivery showed a positive correlation, with significance at the 5% mark (see fig2 below). Thence, a one point increase in the quality of public service delivery results in a 23.28% increase in the percentage of the population with access to electricity.

Figure 2 Scatter Plot of Access to Electricity versus Level of Quality of Institutions (Public Service Delivery)



Equation (3) has gross capital formation as the dependent variable. Again there is significance at 5% between gross capital formation and quality of public service delivery, yet again; the level of democracy fails to show significance (see fig3). On the other hand, because quality is significant but has a negative value, it could be said that a one point drop in the quality of public service delivery will lead to a 3.42% decrease in gross capital formation.

The non-significance of democracy vis-à-vis the quality of infrastructure could be attributed to several rich nations that have good infrastructure, but remain undemocratic. Examples here could include oil-rich golf states, China (because of her population) and other relatively rich countries and kingdoms that are undemocratic.

LIMITATIONS AND DELIMITATIONS

This study faces a lot of limitations with respect to data availability. The main dependent variables; percentage of paved roads and access to electricity have a lot of missing data, and thus lack consistent data across countries for most years. A lot of missing data might weaken the impact of various variables on each other. This data also does not change much from year to year as road expansion projects or expansion of electrification are usually long term projects. These limitations are significant even though control variables like, foreign direct investment and inflation, were included to control for spuriousness.

To address these limitations, a 14 year panel data of 142 countries was used. Also, gross capital formation was included as one of the dependent variables as there is over 90% data availability; the strength of the significance here reveals the importance of consistent data. Gross capital formation also partially includes the other forms of infrastructures used (percentage of population with access to electricity and percentage of roads paved), but goes the extra mile in including other forms of infrastructure such as net additions to physical capital stock and net accumulation of valuables like government procurement of machinery and equipment etc.

This study will be limited to infrastructure such as roads, access to electricity and gross capital formation, compared to the strength of democracy and the quality of public service delivery. Narrowing the scope is geared towards addressing hard infrastructural shortfalls in poorer countries. This work will not delve into information communication technology (ICTs) as soft infrastructure or network of companies (Andrea Campagna, 2009); but rather this work focuses on hard and traditional infrastructure such as roads.

CONCLUSION AND POLICY IMPLICATION

This study started with an overview of previous work that either addressed issues of the quality of institutions or infrastructure or both. These earlier studies focused on how either the quality of institutions or infrastructure has positive effects on the pace of development or development in general; unfortunately, there was less focus on the interconnectedness of institutions and infrastructure, thus the validity of this work. With empirical analysis carried out in this work a few policy recommendations could be made.

Given that institutions if improved in quality ultimately lead to an improvement in the quality of infrastructure, hence, focusing on building stronger institutions is capital. We also know that public private partnership projects are usually more efficient as they secure value for money (VFM) (Government of the Netherlands, 2012); this is part of the reason why public private partnerships exist in the first place. This disparity in efficiency could be attributed to a better institutional and organizational structure of private companies (ADB, 2011). This implies that improving institutions will not only lead to infrastructure of higher quality, but it will also lead to the proper operation and maintenance of such infrastructure leading to durability. Building better institutions based on this work, should focus on the facets that make for quality institutions such as the quality of public service delivery, regulatory quality and control of corruption levels – here we assume that remote facets like the extent and quality of education are also included to get a comprehensive solution.

Although the quality of institutions significantly impacts the quality of infrastructure, they cannot be the panacea for all of the infrastructural problems of all the countries in the world; they constitute a key element though. Alongside institutional quality, other more subtle elements like

political will, the current specific contexts of a country (e.g. war) and priority of needs of a country. The levels of democracy, because they impact all the other aspects of institutions, should be further studied by either dividing countries into two groups (rich undemocratic versus poor undemocratic) and running further regressions to see if significance was affected by the rich countries undemocratic nations; or using other determinants of levels of democracy.

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