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Bureaucratic Complexity and Impacts of Corruption in Utilities

Line Tøndel
Tina Søreide

WP 2008: 2

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1 Introduction

The negative impacts of corruption and poor quality of institutions on economic development are well established. Institutional improvement is a slow process, and simply changing formal procedures will not necessarily have the desired effect. Institutional reform will often imply that more concerns and political motivations are taken into consideration, and the demand on administrative procedures increases. The introduction of more administrative procedures to ensure consumer welfare may result in greater bureaucratic complexity. Greater complexity, in turn, can provide new opportunities to hide corruption, however. Thus, rather than protecting consumer interests more procedures may result in higher levels of corruption and inferior sector performance.²

Whether more complexity works to secure consumer welfare or is exploited as a tool for hiding corruption may depend upon the general quality of institutions and governance. Hence, the same set of procedures might result in different outcomes across countries depending on levels of income, credibility of legal systems, and human capacity.³ This is particularly relevant for the utilities sectors, which are often natural monopolies, characterized by economies of scale and low marginal costs. There are often few firms, and the incentives and opportunities to benefit from market power are higher than in other sectors. Thus there is a stronger need for regulation through bureaucracy. The variation across countries in how complexity works might therefore be expressed more strongly in utilities compared to many other industries.

There is limited empirical information about how the establishment of comprehensive administrative procedures fulfils the goal of higher consumer welfare in terms of improved sector performance. Even if greater complexity increased welfare in higher-income countries with well functioning institutions and a credible legal system, it might raise the level of corruption where institutions are weaker. There are, however, a few studies that address the linkage between various forms of governance and infrastructural performance. Estache, Goicoechea and Trujillo (2006) find that regulatory reforms offset the effects of corruption on performance indicators only to a limited extent and that the effectiveness of reforms is reduced when there is a higher level of corruption. Gasmi, Nomba and Virto (2006) find the positive effect of political accountability on the performance of regulation to be stronger in developing countries.

This study explores how performance across the utility sectors, such as electricity, water and telecoms, is affected by the connection between the level of corruption and the level of bureaucratic complexity. We apply data from the Doing Business and Enterprise Surveys Database collected by the World Bank. In Section 2 of the paper we first look at whether performance in the electricity, water and telecoms sectors in developing countries is systematically affected by the levels of corruption and complexity. We go on to test more thoroughly the relationship between bureaucratic complexity, corruption, and levels of income.

We find that in general, service delivery in the utilities functions significantly better in countries with few procedures and low levels of corruption. We also find that the pattern with respect to corruption, complexity and sector performance differs across income levels. In general, complexity

² Large parts of the literature on corruption relate to the various ways in which corruption can be caused by poor institutional quality (for an overview, see Aidt, 2003; Rose-Ackerman, 1999, 2004; Bardhan; 1997).

³ For instance, the number of procedures behind the award of licenses to operate a business is the same in Bangladesh and Norway, which experience very different challenges with respect to corruption. On the basis of information about the number of procedures in dealing with the public as part of doing business in a country, Germany and Thailand are ranked very equally, while Italy is ranked worse than Colombia, and Spain is ranked worse than Puerto Rico. And yet, the higher number of procedures and greater bureaucracy are part of a system with higher levels of welfare in Germany, Italy and Spain, compared to Thailand, Colombia and Puerto Rico (Doing Business Database).

(the number of procedures) is a significant determinant of corruption levels, but the effect depends on the income level. Higher confidence in the judiciary also tends to reduce corruption. For developing countries only, the effect of fewer procedures is smaller but still significant. Our findings support the notion that simple procedures, by lessening the problem of corruption, holds potential for improving performance.

2 Corruption and Complexity in Utilities

We know that regulatory decisions can be extremely important for firms in the utility sector and they will often have every incentive to influence their terms. A high level of technical complexity of provision and complex financial contracting provide many ways to hide corrupt transactions. Hence, despite the presence of advanced administrative procedures the risk of corruption is perceived to be high in these sectors (Transparency International, 2003; Finger and Allouche, 2002; Hall and Lobina, 2002; Søreide, 2006a).

Advanced bureaucratic procedures are not a clear cut concept, however. First, there might be a number of formal procedures, yet informal solutions may prevail. Rules are not necessarily respected or they may be politically overruled. Second, bureaucratic procedures are usually established to improve welfare and smooth regulation, yet also these decisions can be influenced by corruption. “Greasing the wheels” -theories suggest that bribery speeds up bureaucratic procedures (Leff, 1964; and Huntington, 1968:386). Kaufmann and Wei (1999) tested this theory empirically, and found that higher levels of corruption implied more time spent dealing with the bureaucracy for the business community. Third, it is not obvious how to count procedures. The time it takes to comply with procedures might vary substantially. However, it is not unreasonable to assume that a higher number of procedures entail more bureaucratic complexity.

Bureaucratic complexity can facilitate corruption in several ways, and the problem is relevant for all stages of the regulatory process: (i) prior to operation, in some form of tender manipulation; (ii) during operation, for instance through opportunistic renegotiation of operational terms; or (iii) when the term of operation comes to an end, most relevantly to ensure a new term without competition.⁴ If many concerns are included in the decision-making processes, such as the protection of domestic industrial development, trade politics, employment issues, environmental concerns or district politics, these can be exploited to hide a biased decision. There is then often a legitimate argument that will fit with the characteristics of a company that offers bribes or make significant party contributions. Complex award procedures may provide more opportunities to argue for a certain aspect, and to hide corruption. General monitoring and auditing systems may thus be comprehensive, yet still not able to detect corruption.⁵

A bureaucratic hierarchy, established to facilitate the functions of the state by delegating responsibilities, may contain structures that encourage principal-agent problems, instead of preventing collusion between agents and firms.⁶ An important distinction must be made between corruption initiated by *public officials* who make decisions that are against the will of the political levels, and corruption initiated by representatives of the *political* level, who influence bureaucratic procedures to fulfill a corrupt deal with a private firm.

⁴ See Guasch (2003) for empirical results on renegotiation in utilities, and discussion about opportunistic renegotiation.

⁵ See Della Porta and Vannucci (1999), who argue for more quality control in procurement procedures, because there are so many ways of manipulating the system.

⁶ The principal-agent relationship has therefore been much applied to the exploration of corruption, see for instance Mishra (2006), Acemoglu and Verdier (2000), Olsen and Torsvik (1998) and Laffont and Martimort (1997). This literature makes an important distinction between benevolent and non-benevolent principals (Aidt, 2003).

The first category, corruption conducted by public officials, will represent a violation of procedures, either by making it look like as if all rules have been respected (through bid rigging or violation of communication rules, for instance), or by misusing legitimate deviations from the rules (for instance by referring to discretionary decisions, extraordinary circumstances or previous experience). The opportunities for such corruption depend on the number and/or nature of procedures. Such complexity can either enforce integrity or increase corruption (Moody-Stuart, 1997).⁷

The second category, political corruption, will in this setting refer to the many ways that political levels can influence bureaucratic procedures, for instance by giving instructions to regulatory bodies on how to prioritize between tender criteria or factors that appear to support a political goal. Even if the nature of corruption differs between these categories, depending on benevolent versus non-benevolent principal, it may under each circumstance be easier to hide or carry out the crime if the administrative rules are many or intricate.⁸

We have limited information about who initiates corruption, and we do not know the extent to which the problem tends to be caused by those who offer bribes or those who receive them. This will probably depend on relative bargaining powers and particular characteristics of institutions and markets.⁹ There is also limited information about the private sector's influence on its own regulatory terms and how and why this varies across countries and sectors, although there is strong reason to believe that the problem escalates when legal institutions and monitoring systems are weak (Laffont, 2003). A combination of weak constitutional control over the government, limited contract enforcement, and sunk investments on the side of the firms, not only creates opportunities to demand bribes through extortion, but may also increase firms' incentives to offer bribes, for instance in order to reduce the political risk.

Studies of the linkage between governance and infrastructural performance include Estache et al. (2006) and Gasmi et al. (2006). Estache et al. (2006) consider specifically whether the benefits of regulatory reform depend on the extent of corruption. Their study addresses reforms in the energy, telecoms and water and sanitation sectors separately. Performance is described in terms of the quality, access and prices of the services. They find that reforms offset the effects of corruption on the performance indicators only to a limited extent. The effectiveness of reforms is also reduced when there is a higher level of corruption. Gasmi et al. (2006) analyze the relationship between political accountability and regulatory performance in the telecom sector in developed and developing countries. They measure the quality of political institutions by estimates of local and global accountability.¹⁰

Regulatory performance is represented by mainline penetration rates and mainlines per employee. Gasmi et al. (2006) find the positive effect of political accountability on the performance of regulation to be stronger in developing countries. They also find that global accountability variables

⁷ The balance between discretionary decisions and simple rules is difficult, however, since reduced discretion often will require more detailed rules (Della Porta and Vannucci, 1999)

⁸ Similarly, the mechanisms to control corruption such as control mechanisms, transparency and sanctions, will function differently in these different circumstances. Independent regulatory bodies will seldom be a solution, however. The underlying challenge is related to questions of political benevolence, a long-term horizon for political decisions, and the function of democracy. When these factors work there is little reason to make the regulatory bodies independent, and when they do not there is little reason to expect independence to work.

⁹ On bargaining powers and bribery, see Svensson (2003) and Clarke and Xu (2004), for instance.

¹⁰ Local accountability is measured by estimates of the political and financial independence of the regulator, the level of transparency of accounts and regulatory decisions, the clarity of the allocation of tasks among institutions, and the nature of the legal environment. Global accountability is captured in variables that reflect the quality of the institutional framework, such as corruption, bureaucratic quality, law and order, risk of expropriation and currency risk - IRIS dataset, Knack and Keefer (1987-1997) and International Country Risk Guide ratings 1990-1999, and the quality of the political process and its checks and balances (Database of Political Institutions 1975-2000, Keefer, The World Bank, 2002).

seem to be in a stronger causal relationship with regulatory performance than local accountability variables, especially in developing countries.

We find that there is indeed a positive correlation between the level of corruption and complexity such that countries with lower levels of corruption will also be characterized by less complexity, and vice versa, that countries with higher levels of corruption will more often have higher levels of complexity. We show that on average, sector performance is better when corruption levels are lower.

2.1 Measuring performance, complexity and corruption

Two of the major challenges when exploring the relationship between corruption and complexity empirically are (i) to identify proper measures of complexity and (ii) to determine what are the proper control variables. In addition, there is limited data availability on the performance of the utilities. The most relevant measures of complexity are available for only four years (2003-2006). There is little variation over time for each country, and the number of some procedures remains the same for the majority of the countries over the period. Also, the data on complexity and corruption are more recent than the data on necessary control variables, which are available up to 2004. Given the relatively small change in the measures we are considering, we perform cross-country regressions on the average value of variables for the 2001-2006 period, and not panel regressions.

Corruption

There are several perception-based indices that seek to capture the level of corruption in large samples of countries, such as the Corruption Perceptions Index from Transparency International, the corruption measure from the ICRG index of political stability, and the corruption part of the World Bank's Governance Indicators. While these have all been applied for empirical analysis, this study uses the World Bank's indicator of corruption. The World Bank indicator appears to be the most general measure of corruption in a country. This estimate is part of a larger set of data, where the other measures included are voice, political stability, government effectiveness, law and regulatory quality. There are 84 developing countries included in the sample, and the data are available for the period 1996-2005, annually since 2002. The scores in the World Bank control of corruption index varies from -1.225 to 1.924 where a higher value indicates better control of corruption, which implies a lower level of corruption. The number of procedures for starting a business varies between 4 and 17. Ireland has the lowest number of procedures while Uganda, Brazil and Paraguay have the highest numbers. There is a large variation in the confidence variable ranging from 17 to 90 percent, with the lowest estimate for Bangladesh and the highest for Germany. Although the World Bank indicator has been criticized we still believe it to be the most suitable measure for our purpose.¹¹

Complexity

There is no distinct cross-country estimate of complexity in bureaucratic procedures. Although there are some measures of regulatory quality and some bureaucratic functions, such as bureaucratic quality by ICRG, they do not measure complexity as such. The Doing Business Database, provided by the World Bank, provides information on the number of procedures and time needed for starting a business, dealing with licenses, registering property, enforcing contracts, and more. If the number of such procedures does suggest more complexity, the time spent complying with procedures should be positively correlated with the number of procedures.

¹¹ For a discussion on the suitability of these indicators see Knack (2006).

Table 1. Correlation between number of procedures and time spend complying

Starting a Business	Dealing with Licenses	Registering Property	Enforcing Contracts
0.421	0.235	0.053	0.312

Table 1 indicates that there is a positive correlation between the time spent and number of some of the procedures, and that this correlation is stronger when it comes to the number of procedures to start a business. This variable is an average of all generic procedures that are officially required for an entrepreneur to start up an industrial or commercial business in a country. The estimations are based on a set of assumptions about the firm, and the procedures are official, not part of an informal system, and apply to all businesses.¹²

The other alternatives from the Doing Business dataset are related to specific tasks, such as dealing with licenses when constructing a warehouse. One of the advantages of applying one of the Doing Business Indicators is that the agencies involved are assumed to function without corruption. Based on these considerations we prefer the number of procedures necessary to start a business variable from the Doing Business Database as our measure of complexity throughout the paper. Thus, our findings depend on the suitability of this variable as an indicator of overall bureaucratic complexity. Generally, as shown by the governance indicators (Kaufmann et al., 2006) the bureaucratic functions are correlated. We make the implicit assumption that when procedures are complex in one sphere of the economy this is a general trait.

Performance

Performance of service delivery in the infrastructural sectors is most often measured by quality, rates and access. For our study we include measures of performance from the energy, water and sanitation and telecom sectors. The different performance measures are associated with either quality of service, accessibility or price. We have included measures of quality and accessibility for all three sectors, but the price of service delivery is available for a sufficient number of countries in the telecom sector only. The measures included are listed in Table 3 page 8.

2.2 The Impact of Corruption and Complexity on Utility Performance

We have a highly restricted dataset as measures of sector-specific performance are relatively scarce. Thus we base this part of the analysis on descriptive statistics. We consider only the developing countries. The countries are divided across two dimensions, corruption and complexity. Half of the countries are defined as being more corrupt and the other half as being less corrupt. The same division is made according to the level of complexity with respect to bureaucratic complexity. Countries are thus placed in one of four categories depending on the level of corruption and complexity. The categories are denoted as I) Less Corruption & Less Complexity, II) Less Corruption and More Complexity, III) More Corruption and Less Complexity, and IV) More Corruption and More Complexity. The number of countries in each category is listed in Table 2.

As described by Table 2, 53 of the 84 countries fall into categories I and IV where we have little corruption and less complexity and more corruption and greater complexity, respectively. Thus there is a noticeable pattern whereby well over 60% of the countries display similar levels of complexity and corruption. We find that 5 out of 11 oil-rich countries fall into the group characterized by more corruption and more procedures.¹³

¹² See World Bank, 2006 for more information.

¹³ These are Algeria, Azerbaijan, Cameroon, Ecuador and Syria. Russia and Kazakhstan fall into category III, Cape Verde, Colombia and Egypt are in category II with less corruption and more procedures, whereas Oman is in category I where we have less corruption and less complexity.

Table 2. Country Group Categories

Category		Developing Countries (84)
I	Less Corruption & Less Complexity	26
II	Less Corruption & More Complexity	16
III	More Corruption & Less Complexity	15
IV	More Corruption & More Complexity	27

First we consider the effect of complexity and corruption on utility performance separately. We find that less complexity is associated with better performance. On average, countries that are less corrupt will also perform better than those deemed to have a higher level of corruption. In Table 3 we list the mean and standard deviation of a range of performance indicators for the “level categories” IV and I.

Table 3 suggests that there are in fact such systematic differences whereby the “few procedures-more control of corruption” countries perform better in most infrastructure performance measures than do the “more procedures - less control of corruption” -group.

Table 3. Comparing Performance Between Countries in Categories I and IV

Measure of sector performance	Less Corruption & Less Complexity (I)			More Corruption & More Complexity (IV)		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Delay in Obtaining an Electrical Connection*	26	15.78	14.33	27	25.10	21.28
Number of Electrical Outages*	25	17.77	37.29	26	25.00	28.87
Electric Power Consumption, 1000 kWh pr Cap	22	2.45	1.68	22	1.08	0.91
Delay in Obtaining a Mainline Tel. Connection*	26	16.59	27.12	27	37.57	45.12
Telephone Subscribers per Employee	17	344.15	169.59	16	247.85	206.31
Telephone Faults per 100 Mainlines	22	24.28	18.24	14	53.12	47.49
International Voice Traffic, Minutes per Person	24	57.27	34.66	23	38.92	53.60
Internet Users per 1000 People	26	124.57	95.21	27	30.86	28.10
Population Covered by Mobile Telephony	23	86.16	16.41	25	68.78	21.53
International Internet Bandwidth, Bits per Person	25	286.44	543.75	27	18.99	38.87
Price Basket for Internet	26	26.41	12.82	27	40.37	32.25
Price Basket for Mobile	25	12.07	4.95	26	11.35	9.08
Price Basket for Fixed Line	26	11.91	4.79	25	6.88	3.81
Number of water Supply Failures*	26	7.53	11.49	26	20.31	35.51
Improved Sanitation, % of Pop. with Access	21	74.19	21.46	24	59.35	21.32
Improved Water Source, % of Pop. with Access	21	84.52	12.18	25	78.82	15.23

* days

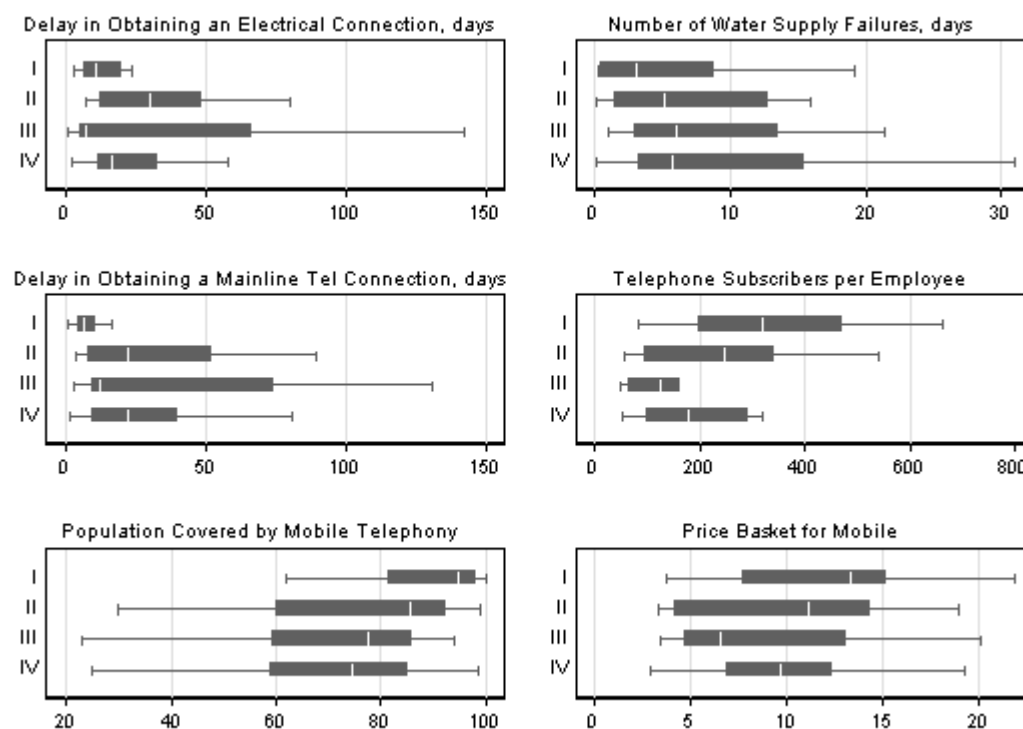
The observed pattern does suggest that fewer procedures and less corruption are associated with better performance in utilities among developing countries. The only deviation from this general pattern is found in the prices of telecoms services. In the case of prices for mobile telephony, Pakistan, China, the Philippines, Guatemala and Indonesia contribute to the low average price in the group. In the case of fixed line telephony prices are lower in the former Soviet Republics and in Syria and China.

Figure 1 shows the mean and standard deviation of selected performance indicators from the energy, water and telecoms sectors for the four categories. The countries in category I, with less

corruption and less complexity, are the best performers when measured by group average for five of the six performance indicators in the figure. We see that the countries in categories I and III, which are both associated with less complexity, experience fewer delays when obtaining both an electrical connection and a mainline telephone connection. When we consider the number of telephone subscribers per employee and the share of the population covered by mobile telephony, it is countries in categories I and II, with less corruption and complexity, that perform better. However, the price of telephony is lower for categories III and IV where there is more corruption and less and more complexity, respectively. Thus prices are higher where coverage is best and vice versa. It might be therefore that the extra cost of better coverage is manifested in higher prices.

When we look at performance for the countries that are characterized by more complexity we see that overall, the group of countries with less corruption performs better (countries in the II category outperform those in the IV category from Figure 1). The only deviation from this general pattern for these six indicators is the delay in obtaining an electrical connection where the more corrupt countries on average have fewer delays.

Figure 1. Summary Statistics for Selected Performance Indicators by Categories (I-IV)



We are also interested in assessing the effect of income levels, and thereby institutional quality, on how complexity and corruption affects performance in the infrastructure sector.¹⁴ The sample of 84 developing countries is therefore divided into two sub-groups of 42 countries, each based on average per capita income over the last decade. We refer to these as the higher and lower income groups, although they are all developing countries. Table 4 shows the number of developing countries that fall into each of the eight categories based on the number of procedures, level of

¹⁴ Income levels correlate with institutional quality, and may thus be an indicator of the impact of institutional quality.

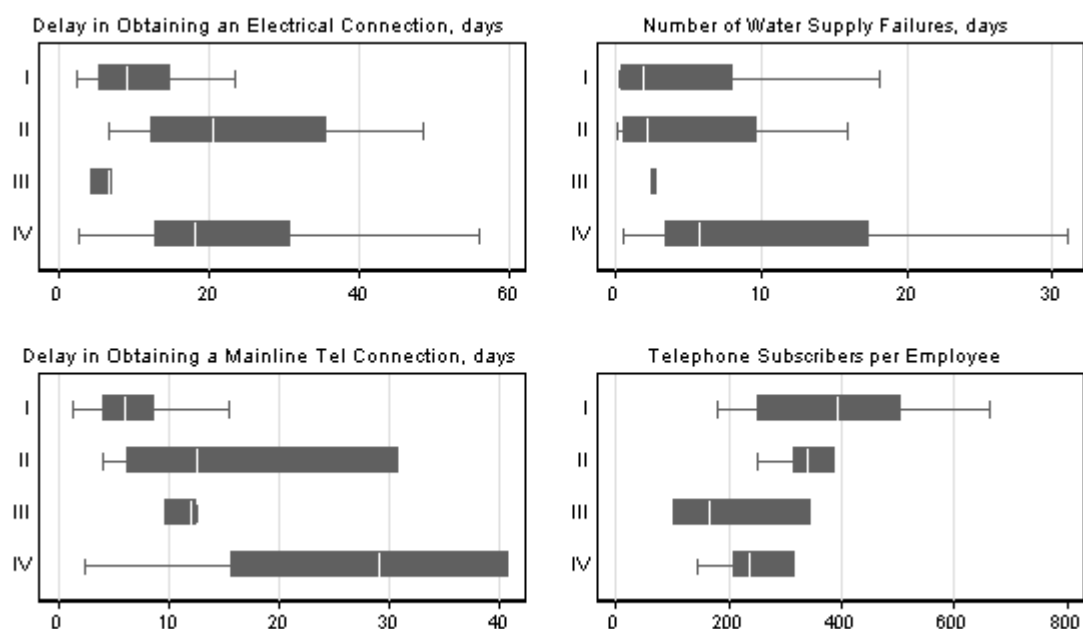
corruption and income level. First we notice that 29 of the 42 countries in the higher-income half of the sample fall into the less corruption categories, whereas the same share of countries in the lower-income half falls into more corruption categories. Thus there is a correlation also between corruption and income levels. This is not the case for income and complexity, though, where the division is relatively similar across both dimensions: 23 higher-income and 18 lower-income countries that are less complex and 19 higher-income and 24 lower-income countries that are more complex.

Table 4. Country Group Categories by Income

	Category	Higher-income	Lower-income
I	Less Corruption & Less Complexity	20	6
II	Less Corruption & More Complexity	9	7
III	More Corruption & Less Complexity	3	12
IV	More Corruption & More Complexity	10	17

In Figure 2 we compare the result for higher-income developing countries in the four categories in respect of four measures of infrastructural performance. For the last two performance measures (population covered by mobile telephony and its price basket), the picture is similar to that in Figure 1. We see again that generally the category I countries with less corruption and less complexity perform better across sectors. The results are less clear for the other categories. However, categories II and III, where there is either less corruption or less complexity, generally perform better on average than do the category IV countries, where there are higher levels of both corruption and complexity.

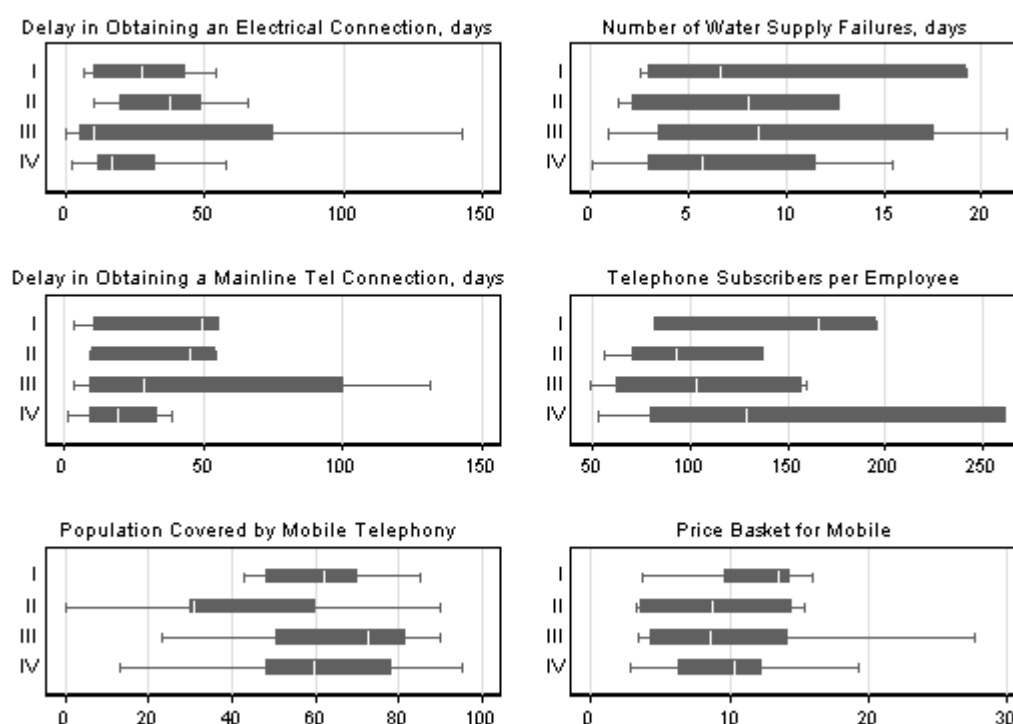
Figure 2. Higher-Income Countries: Summary Statistics for Selected Performance Indicators by Categories (I-IV)



The pattern among lower-income developing countries is given in Figure 3. First, we note that there are few lower-income developing countries in categories I (6) and II (7) where the corruption level

is lower. Most countries fall into categories III (12) and IV (17), in which the level of corruption is higher. In Figure 3 we notice that the delay when obtaining an electrical connection is actually lower in the two categories where there is more corruption. Performance among the more corrupt countries is better when there is less complexity, however. With respect to the number of water supply failures, categories I and IV perform best, that is when we have equal levels of corruption and complexity. The same pattern is seen also for the number of telephone subscribers per employee. When we consider delays in obtaining a mainline telephone connection the category III and IV countries are again best performers. The share of the population covered by mobile telephony is similar for three of the categories while it is noticeable lower for the group of countries where the level of corruption is low but complexity is higher.

Figure 3. Lower-Income Countries: Summary Statistics for Selected Performance Indicators by Categories (I-IV)



Generally, between the two categories identified as having a lower level of corruption, the group of countries where complexity is lower scores higher with respect to utility performance. There is not such a pattern between the countries with less or more complexity when the corruption level is higher. However, for the lower income countries it does seem as if category IV countries outperform category II countries (Figure 3). Thus, given a high level of complexity, countries that are more corrupt display better utilities performance. Tajikistan and Azerbaijan are in the IV category. These two former Soviet Republics perform well in utilities compared to other countries with high levels of complexity. They also display high levels of corruption. The relatively well functioning infrastructure is to some extent a legacy of history. This pattern might suggest that simplifying procedures alone will not ensure better performance.

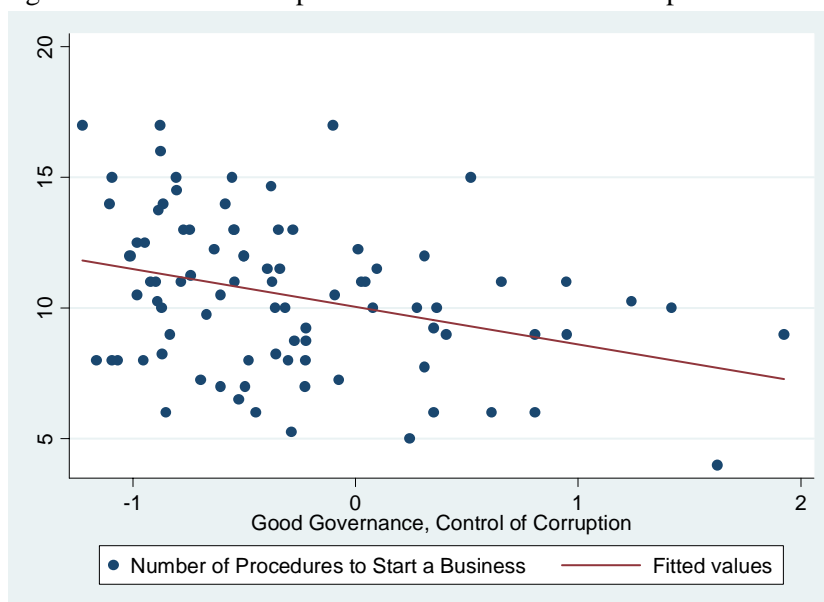
The next section explores further the corruption-complexity relationship and takes into account the importance of institutional quality and income level.

2.3 The Relationship between Complexity and Corruption

We assume that the opportunities for corrupt actions may grow with increasing complexity. Our hypothesis is that the extent to which this complexity is exploited depends upon the quality of other government institutions in the country. The same set of procedures can thus have different implications in different countries.

The panel regressions with country fixed effects that are most commonly used in this type of study exploit variation over time. However, we have limited data accessibility and concentrate on mechanisms that are relatively rigid and consistent for each country over time. A simple cross-country study is therefore useful. Figure 4 illustrates that for our cross-section of countries less procedures are associated with more control of corruption.

Figure 4. The number of procedures and control of corruption



The extent to which complexity provides opportunities for corruption or for welfare improvement may depend on other characteristics of the economy. We control for the level of development by including GDP per capita. A variable measuring the level of confidence in the judicial system is included to control for the quality of institutions, and is particularly relevant for corruption. There is a correlation of 0.36 between the level of confidence in the judicial system and GDP per capita. Although good institutions and development tend to be positively associated, we include both variables in the regression. Since we expect a stronger correlation between corruption and complexity when the GDP level is lower, we include an interaction term between the number of procedures and the level of development, GDP per capita in the regression. Finally, since resource-rich developing countries are more prone to higher levels of corruption, we include a dummy variable which recognizes the effect of being a resource rich country. The summary statistics for the sample are reported in Table 5. There are now 90 countries in the sample. These are the same 84 developing countries that were the basis of our analysis of performance and six developed countries

as well. These are included to control for differences across income levels with respect to the relationship between complexity and corruption.

Table 5. Summary statistics, averages for the 2001-2006 period

<i>All countries</i>	Obs	Mean	Std. Dev.	Min	Max
Control of Corruption	90	-0.27	0.69	-1.23	1.92
Number of Procedures to Start a Business	88	10.49	2.93	4.00	17.00
Confidence Level in the Judiciary	70	58.96	15.48	17.02	89.68
Real GDP per capita, 2000 US\$	90	2876.00	4401.31	105.10	27372.96
Interaction(GDP per Capita*Procedures)	88	26474.05	37246.30	779.18	210901.1
<i>Developing countries</i>					
Control of Corruption	84	-0.38	0.56	-1.23	1.37
Number of Procedures to Start a Business	82	10.56	2.90	5.00	17.00
Confidence Level in the Judiciary	64	57.63	14.99	17.02	87.08
Real GDP per capita, 2000 US\$	84	1916.45	1879.26	105.10	8771.89
Interaction(GDP per Capita*Procedures)	82	18171.58	18433.92	779.18	105505.90

In Table 6 we report the Spearman correlation coefficients for the variables included in our regression analysis. We see that the correlation coefficient is 0.6684 between GDP per capita and the control of corruption measure. The zero-hypothesis that the two variables are independent is rejected at the 1 percent level. Thus there is a positive relationship whereby higher GDP per capita is associated with more control of corruption. From the table we also see that the higher the confidence level in the judiciary, the higher score on the control of corruption indicator (0.4359). Also for these two variables, the hypothesis of independence is rejected at the 1 percent level. This is also the case for the relationship between our measure of complexity, the number of procedures, and control of corruption. The coefficient is negative at -0.3265, suggesting that a higher number of procedures are associated with a lower score on the control of corruption index. Again the lower score indicates less control of corruption. We see also that there is a negative correlation between the presence of natural resources and control of corruption, suggesting the importance of controlling for resources when looking into the complexity-corruption relationship.

Table 6. Spearman Rank Order Coefficient, all countries

Variable		I	II	III	IV
Control of Corruption	I	1.0000			
Number of Procedures to Start a Business	II	-0.3265*** (88)	1.0000		
Confidence Level in the Judiciary	III	0.4359*** (70)	-0.0069 (69)	1.0000	
Real GDP per capita, 2000 US\$	IV	0.6684*** (90)	-0.2171** (88)	0.2701** (70)	1.0000
Natural Resource (fuels/ores)	V	-0.1767 (86)	0.2061* (84)	0.0979 (67)	-0.1112 (86)

The number of observations is in parenthesis.

The significance level at which the zero hypothesis of independence between variables is rejected:

** 10% level, ** 5%, *** 10% level*

Regression Results

Table 7 reports the results from robust regression of the Control of Corruption measure from the Governance Indicators. We reported results for the pooled sample of developing and developed countries, including a dummy identifying the developing countries and the result for the developing countries only. For the pooled sample we see that a lower number of procedures is associated with stronger control of corruption. That is, more procedures are associated with higher levels of corruption. However, the interaction term between the number of procedures and GDP per capita is positive, which supports our hypothesis since this implies that the relationship between complexity and corruption depends on the country's GDP level. The presence of natural resources has a negative effect of the control of corruption measure. However, we also see that even though the regression returns a relatively high R^2 at 0.7989, the RESET test rejects the hypothesis that there are no omitted variables. There are only six developed countries in the sample. When we run the regression on developing countries only, the coefficient for number of procedures is nearly halved and the importance of GDP per capita in determining the level of control of corruption increases. Also the interaction variable for GDP per capita and number of procedures is no longer significant.

Table 7. Results from Robust Regression on 2001-2006 averages

	Developed and Developing Countries Pooled		Developing Countries	
Number of Procedures to Start a Business	-0.061*** (0.014)	-0.060*** (0.014)	-0.028** (0.011)	-0.036** (0.018)
Confidence Level in the Judiciary	0.008*** (0.003)	0.008*** (0.003)	0.009*** (0.003)	0.009*** (0.003)
Real GDP per capita, 2000 US\$	0.00004* (0.00002)	0.00005** (0.00002)	0.0002*** (0.00002)	0.0002* (0.00009)
Natural Resource (fuel/ores)	-0.264** (0.101)	-0.277*** (0.095)	-0.289*** (0.091)	-0.291*** (0.091)
Interaction(GDP per Capita*Procedures)	0.000008** (0.000003)	0.000009*** (0.000003)		0.000005 (0.000009)
Developing Countries Dummy		0.407 (0.448)		
Constant	-0.457** (0.207)	-0.889 (0.550)	-0.982*** (0.172)	-0.900*** (0.185)
R²	0.7989	0.8048	0.7398	0.7412
F-test all coefficients=0	p-value 0.0000	p-value 0.0000	p-value 0.0000	p-value 0.0000
Reset Test	p-value 0.0001	p-value 0.0002	p-value 0.6149	p-value 0.4468
B-P/C-W test for heteroskedasticity	p-value 0.0420	p-value 0.0165	p-value 0.3258	p-value 0.3739
Number of observations	66	66	60	60

* Indicates significance at the 10 percent level

** Indicates significance at the 5 percent level

*** Indicates significance at the 1 percent level

Even if the R^2 at 0.7412 is lower for the developing countries sample, the RESET test now cannot reject the hypothesis that there are no omitted variables and thus provides a more accurate representation of the empirical relationship for this sample.

3 Conclusion

For most of the performance measures there are few observations, and it is difficult to apply regression analysis. We have therefore divided our sample into several categories of countries based on the level of corruption, complexity and income in order to assess the effect of complexity and corruption on the sector performance of utilities. We find that for the full sample of 84 developing countries, the level of corruption and complexity coincides as 53 countries fall into categories I and IV, where we have less corruption and less complexity and more corruption and more complexity respectively.

With respect to performance, the general rule seems to be that performance is better when corruption and complexity levels are lower. When we split the countries into two sub-groups based on income levels, this still holds true for the higher income half of the sample. As many as 30 of the 42 countries fall into categories I and IV, in which the levels of corruption and complexity corresponds. Most of the countries in the higher-income half are characterized as being less corrupt (29 of 42). The situation is different when we consider the lower-income half of the sample, however. Then we see that 29 countries are perceived as being more corrupt, and there is no longer a correspondence between corruption and complexity levels. For this group performance is also not generally better when corruption and complexity levels are lower.

This lends support to a hypothesis that having a large number of administrative rules may function differently in rich and poor countries. In countries with strong institutions the procedures may function as intended and guarantee a thorough administrative process, hence serving as a barrier against ad hoc solutions and favoritism. In poorer countries with weaker institutions a large number of procedures, established with the same intention, may have the reverse effect and increase the risk of corruption. Further this could suggest that when designing instruments of regulation to tackle corruption, for example in terms of simplifying procedures, these might work differently according to income level.

Income levels are highly correlated both to the corruption level, as we have see here, but also to the general level of institutional quality. If fewer and simpler procedures are meant to be a counter-measure against corruption demands are made on institutional quality as well. If fewer procedures result in more transparency, there is still a need for information to be disseminated and for some form of control of violations. A well-functioning judiciary and a free press that is willing and able to report abuses of power would be supplements to simplifying procedures. Thus, countries need to reach a certain level of institutional quality to benefit from less complexity.

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SUMMARY

This paper explores how the relationship between bureaucratic complexity and corruption affects the performance in utilities. We observe considerable variation in the performance of the utilities across countries, also across countries which appear to be relatively similar in terms of GDP per capita. Our hypothesis is that corruption is an important explanatory factor. In particular, corruption coupled with a complex regulatory structure can have negative effects on performance in this sector. The analysis points at the importance of considering the institutional framework and quality when introducing new bureaucratic procedures, as the same set of policy advice can work differently across countries. We measure bureaucratic complexity by the number of procedures needed for starting a business from the Doing Business Database provided by the World Bank.

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