

Public Procurement Regulation and Road Quality

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WORLD BANK GROUP

Development Economics Vice Presidency

Office of the Chief Economist

November 2017

Abstract

Public procurement regulation is an important instrument for using public resources efficiently and ensuring quality services to citizens. On average, the public procurement sector accounts for 14.5 percent of the gross domestic product globally. Using new data, this study documents public procurement regulation and related processes in 142 economies. Scores for three public procurement areas are

constructed and amalgamated into an overall quality of public procurement index. The index is then related to a measure of road quality across countries. The results indicate that improvement in the public procurement system improves road quality, especially in non-Organisation for Economic Co-operation and Development countries.

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Acknowledgments: The authors are grateful for comments provided by Stephen Knack and Rodrigo Archondo-Callao. The authors thank Janez Kren for excellent research assistance.

JEL Code: H57, H54, R42, L50

Keywords: public procurement, regulation, infrastructure, road quality

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Introduction

In 2016, government agencies spent approximately \$35 trillion on public procurement-related transactions on behalf of their citizens. On average, the public procurement sector accounts for 14.5% of the gross domestic product (GDP) and in developing economies it may be even larger, with Angola and Eritrea at 26% and 33%, for example (Djankov et al 2016). Given its magnitude, public procurement is an important part of public sector policy.

Public procurement regulation is an important instrument to use public resources efficiently and to ensure quality services to citizens. Improving public procurement regulation may result in greater competition, better services, goods, and lower cost for governments (Campos et al. 2007). The existing literature on public procurement regulation has studied the determinants of public sector costs or linked the public procurement process to infrastructure quality outcomes. A strand of the literature has investigated the effect of discriminatory public procurement policies on service delivery costs, for example McAfee et al. (1989), Vagstad (1995), Branco (2002), Naegelen et al. (1998), Nakabayashi (2013), Brulhart et al. (2004), Marion (2007) and Krasnokutskaya and Seim (2011). Other studies have focused on how the costs of public service delivery are affected by a specific element of public procurement such as publicity (Coviello and Mariniello, 2014; Lewis-Faupel et al., 2016), incentives for accelerated delivery (Lewis et al., 2011), audits (Di Tella and Schardgordsky, 2003; Olken 2007), reputational mechanism (Spagnolo 2009) and competition (Estache and Iimi, 2008; Ohashi 2009). The effect of public procurement regulation on firm engagement is studied using the World Bank's Public Expenditure and Financial Accountability assessments (Knack et al., 2017).

Research comparing public procurement regulations across countries and analyzing their impact on economic performance has been limited due to the lack of comparable data. This study

documents public procurement regulation and related processes in 142 economies using a new data set that covers key regulations that affect the ability of private sector companies to do business with governments. Several stages of the procurement process are identified: bid preparation, bid and contract management, and payment of suppliers. Based on these inputs, we construct an overall index of the quality of public procurement (PP score). We next link the public procurement process to a crude measure of road quality maintained by the World Bank. The data measure the quality of trade and transport-related infrastructure.

There are a number of mechanisms by which improvements in aspects of public procurement can lead to improvements in infrastructure outcomes such as road quality (Lewis-Faupel et al., 2016). Lowering transaction costs by providing better access to information in the procurement system results in a greater number of firms involved in the process. The participation of a larger pool of firms increases the possibility that a firm of higher quality or a more productive firm may win the bid, directly leading to an increase in the performance of the project and hence road quality. Furthermore, the possibility of bidder collusion is reduced by increasing competition. Local cartels are more likely to be broken up as bidders outside the region are engaged in the procurement process. Local cartels would have disincentives to deliver projects of high quality and thus their inability to collude may result in better infrastructure outcomes. Finally, a transparent public procurement system gives government officials less maneuverability to withhold information. This would decrease the likelihood of selection of favored bids by government officials and obviate the potential obstructions of non-favored bids. Allowing a level playing field for bidders would increase the chances of productive firms winning the bid leading to better infrastructure projects. A study on India finds that the use of e-procurement increases road quality grades by 12 percent (Lewis-Faupel et al., 2016). The main mechanism uncovered is

that transparent procurement systems lead to the engagement higher quality contractors, not necessarily the improvement of existing contractors.

We find that public procurement regulation that is transparent, competitive and streamlined is associated with better infrastructure quality. The higher the score on the quality of public procurement, the better the road quality outcomes. Specific aspects of the public procurement – bid preparation, bid and contract management, and payment of suppliers - are also found to be strongly correlated with greater road quality. These findings stand after accounting for the rule of law, level of development, as well as the size of the urban population in an economy. The rest of the study is structured as follows. Section 1 explores the construction of the database, section 2 provides some basic results from the database while section 3 explores the findings for OECD vs. non-OECD economies. Section 4 concludes.

1. Description of the Data

This study constructs a database that characterizes the public procurement regulation for 142 economies in 2016. The three key areas are the bidding process, the content and management of the contract, and the payment of suppliers involved in public procurement. The choice of these areas was guided by a review of previous academic literature and by consultation with world

leading experts² on public procurement and the regulation teams of private sector companies with international presence.³

The data on public procurement were collected through structured expert surveys. Respondents were chosen based on their expertise in public procurement law as well as their experience in advising businesses that are interested in providing services to the government. Respondents include private sector companies, professionals in law firms, accounting firms, business advisory firms, chambers of commerce, legal bar associations, and public officials dealing with public procurement. Over 1,900 experts responded to the surveys, which were then coded by a World Bank team managed by one of the authors.

To obtain comparable data across countries, a hypothetical scenario was developed to anchor survey responses. This approach follows Djankov et al (2002) in devising a methodology for evaluating business regulations. The standardized case study for public procurement has assumptions on three elements: (i) the procuring entity, (ii) the bidding company, and (iii) the public call for tender. The procuring entity is restricted to one that is located in the economy's largest business city, is a local authority, and is planning to resurface a flat two-lane road with asphalt. The bidding business is a limited liability company, operates in the economy's largest business city, is 100 percent domestically and private owned, and has previously responded to public calls for tender and won similar-size service contracts. The following assumptions are made regarding the public call for tender. First, it is initiated by the procuring entity. Second, it follows an open and competitive process. Third, the public tender concerns the resurfacing with asphalt of

² Experts from the following international organizations and universities were consulted: European Bank for Reconstruction and Development (EBRD), Inter-American Development Bank (IaDB), Islamic Development Bank (IsDB), Millennium Challenge Corporation (MCC), Organisation for Economic Co-operation and Development (OECD), United Nations Commission on International Trade Law (UNCITRAL), George Washington University, University of Nottingham, and University of Rome Tor Vergata.

³ Several round table discussions on relevant public procurement regulation and processes were held with procurement specialists at General Electric, Microsoft, Merck, Boeing, Veolia Environment, Cisco, Green Soluce and Siemens.

a flat two-lane road. The value is defined as the greater of: (i) 91 times the economy's income per capita or (ii) \$2 million.

The methodology carries a number of limitations. For instance, the responses for the survey are not based on a representative sample. The assumption is that the regulation for procurement is the purview of experienced experts and thus a small number of experts would be able to respond with precision to the survey. Furthermore, the data are for a single year (2016). Finally, the data focus on a set of procurement indicators in the largest business city. In large economies, and particularly in federal states, there may be different public procurement regulations applicable depending on the physical location or the type of procurement activities.

Definition of variables

There are three areas of public procurement considered in this study – (i) bid preparation, (ii) bid and contract management, and (iii) payment to suppliers. These three elements capture critical aspects of the public procurement lifecycle, especially in the eyes of potential suppliers (Table 1). The specific scoring rules are provided in table A1 for each of the three areas.

Bid preparation includes a needs assessment and the call for tender. This is the first phase of the public procurement cycle and it is the entry point for firms into the process. Lack of transparency will block firms from engaging in any part of the procurement process. The main areas covered include whether the consultation process involved the private sector, whether internal market analysis was undertaken, the default method of procurement, the online accessibility of materials and information necessary for suppliers to be able to bid, such as procurement plans, tender notice, and tender documents.

Bid and contract management covers relevant aspects related to the eligibility of foreign firms, availability of online bid submission, the existence and requirements for bid security, bid evaluation criteria, the use of model contracts with standard clauses that the purchasing entity uses when awarding a contract, and measures related to the modification of the procurement contract. These elements are critical in the procurement life cycle. The transparency of the criteria used to evaluate bids, for example, ensures a fair process and thereby encourages more firms to participate. Content and management of the procurement contract phase is crucial given that suppliers are most vulnerable at this stage to unilateral actions by the procurement entity.

Payment of suppliers is important as delayed payments from the purchasing entity could significantly reduce cash flows for firms, potentially affecting their servicing ability. This indicator incorporates several aspects including the procedures required to request payments, the timeframes for processing and disbursing payments, and how delayed payments are handled.

Based on these three categories, an overall score is created for the quality of public procurement. This score is an average of the scores of the individual three categories. Table 2 presents the correlations of each of the three categories with the overall score and each other. All pairwise correlations are positive. All correlations are statistically significant at the 1% level except for the correlation between the payment of suppliers and the bid and contract management score. All three categories have a positive correlation with the overall score, statistically significant at the 1% level. Thus, each category contributes positively to the rating on the quality of public procurement.

Table 3 presents the ranking of economies based on the overall Public Procurement index. The top performing high-income economy is the United States while the bottom is Namibia. The top 10 economies are all high-income economies in Europe or North America, with the exception of the Republic of Korea. The bottom 10 economies are more spread out across Sub-Saharan Africa, East Asia, Middle East and North Africa, as well as the Caribbean. In general, economies with higher incomes tend to have better public procurement regulation. This can be seen in the scatterplot presented in figure 1 between the PP score and GDP per capita income.

Dependent Variable

Our measure of road quality is the quality of trade and transport-related infrastructure measure obtained from the Logistics Performance Index maintained by the World Bank. This data set is based on a survey of logistics professionals who are asked questions about the countries in which they operate.⁴ The quality of trade and transport infrastructure is rated from “very low” (1) to “very high” (5). The average road quality score in the sample is 2.8. Germany has the highest (4.44) followed by the Netherlands (4.29) and Sweden (4.27). Haiti has the lowest score (1.47), followed by Equatorial Guinea (1.5) and Mauritania (1.54).

Control Variables

We include several variables that may be correlated with road quality. This includes the level of development (GDP per capita) and the quality of institutions – proxied by the rule of law. Annual rainfall precipitation and the proportion of urban population are likely predictors of road quality and are thus included as covariates in the estimations. The mean precipitation in the sample is

⁴ The Logistical Performance Index does have some limitations given that it is based on a single rating. However, data on road quality are quite difficult to find, especially for developing economies (Russ et al., 2017).

1,109 mm per year. Colombia has the highest average annual precipitation (3,240 mm per year), while the Arab Republic of Egypt has the lowest (51 mm per year). With regards to urbanization, the mean percentage of urban population in the sample is 59.5%. Singapore has the highest rate of urbanization (100%), while Trinidad and Tobago has the lowest (8.55%). Specific definitions of the variables and summary statistics can be found in tables 1 and A1, respectively.

Table A2 provides the summary statistics for all variables.

2. Results

In this section, we explore whether the quality of public procurement correlates with road quality. In every country, it is expected that the government has a prominent role in expanding and maintaining road infrastructure. In figure 2 we present a simple scatterplot between road quality and the overall PP score. As seen in the figure, there is a positive relationship between road quality and the PP score.

To test the strength of this relationship, we next explore the relationship between public procurement quality and road infrastructure using regression analysis. The findings are presented in table 4. All estimations use robust standard errors. Column 1 presents the base regression, which only includes the log of GDP per capita and region fixed effects as controls. As shown, the public procurement index has a positive relationship with road quality, statistically significant at the 1% level.⁵ The log of GDP per capita has a positive and statistically significant relationship with road quality. In column 2 we control for the rule of law (Burgess et al., 2015). The sign and significance of the coefficient of the overall public procurement score is retained. The coefficient for rule of law is positive and statistically significant at the 1% level. We next add other factors that could

⁵ The results are unchanged if we use a specification with the log of road quality as the dependent variable.

impact the physical quality of the road such as precipitation and urbanization. As shown in the results in column 3, urban population and precipitation have no significant effect on road quality, while the sign and significance of the coefficient of the public procurement scores is retained. In column 4 we further include general government final consumption expenditure as a percentage of GDP to account for the size of government. The positive coefficient of the overall public procurement score is retained as well as the statistical significance of the coefficient.⁶

Table 5 presents findings for each of the components of the public procurement score. All components have a positive coefficient statistically significant relationship at the 5% level of significance. One implication of the findings is that a good procurement system needs to perform well in all categories, and thus the statistical significance of the coefficient of the overall score is higher than the coefficients of the individual components.

The results for the *Bid Preparation* score are in line with previous studies. For example, it is well recognized that e-procurement portals simplify the tendering process and are powerful tools to fight against fraud and corruption. More importantly, they provide value for money for governments because they promote competition, which lowers prices and thus procurement costs. Economies that have implemented the use of electronic means have reported significant efficiency gains. In Brazil, for example, from 2000 to 2006 there have been savings of 51% in transaction costs and 25.5% in price reductions. Canada is another example where the e-tendering approach helped the federal government realize over \$6 billion dollars in annual savings by outsourcing the manual duplication and distribution of physical bid documents to potential suppliers that had

⁶ Both the road quality and public procurement measures are ordinal in nature. Thus, we caution deriving elasticities from the magnitude of the public procurement coefficient given the difficulty in interpretation.

previously registered in various source lists maintained by different agencies (United Nations 2011). Such increases in efficiency entail a transparent process. Countries that have better access to procurement information online, complemented by an overall better accessibility to key information for suppliers (e.g. outcomes of consultation with the private sector, bidders' questions, etc.), lead to the engagement of higher quality contractors that would manifest itself in the production of higher road quality.

The positive and significant correlation of the *Bid and Contract Management* scores also supports previous findings in the literature. For example, mandatory minimum time to prepare and submit bids and the possibility of submission of bids through electronic means not only reduce transaction costs for bidders but also ensure higher participation, as preparing a bid can require hiring consultants, preparing plans, producing samples and performing other time-consuming tasks. This is the case in Georgia, where suppliers can submit their bids using the electronic procurement portal and bids are always opened electronically. This process has led to a rise in the number of tenders from 1,923 to 33,000 when the e-procurement platform reform was launched between 2010 and 2011. Similarly, in the United States procurement information such as the notice of calls for tender and tender documents all the way to notice of awards must be published online. Korea is yet another example where the digitalization of procurement has yielded benefits and reduction in costs. In addition to being able to access needed documents online, bidders in Korea may submit their bids and attend the bid opening session electronically from anywhere. In fact, the country has registered savings of US\$4.5 billion with transaction costs on a total volume of US\$44 billion in 2006. Furthermore, the electronic system in Korea has contributed to increasing efficiency in the public administration as well as preventing illegal practices and collusive acts

through increased transparency (OECD 2012). The engagement of a larger number of bidders ensures higher quality bidders and reduces the likelihood of local cartels, leading to road quality projects of higher quality (Lewis-Faupel, 2016).

One area for which little prior evidence exists is related to pecuniary requirements such as bid security, which may be possible barriers to the procurement market, especially for small enterprises. On the one hand, bid security deposits ensure serious offers and guarantee that bidders will not withdraw their bids from the procurement process in an untimely manner. On the other hand, the amount of bid security should be clearly stated in the law. Our results suggest that countries where bid security is requested for the procurement of works as a form of bid guarantee and the supplier has a choice regarding the form of bid security instruments show better outcomes in term of road quality. A bid security is a common requirement and emerges in all but 14 economies surveyed. Nevertheless, in less than half of them suppliers are given a choice as to the form of bid security to use. This is the case for example in Austria, Brazil and China where bidders can either resort to a bank guarantee, an insurance guarantee or fulfill the bid security requirement in cash. In Canada, bank and insurance guarantees are acceptable forms of bid security and remain at the discretion of the bidder.

Finally, having post-award contract variations published ensures transparency, reduces the risk of corruption and may enhance competition. Our analysis sheds some light on this important aspect for which comparative studies are not yet available. Post award contract modifications, not communicated to all bidders, may incentivize fraudulent awards to companies at lower prices and more complex technical features with the agreement of “secretly” modifying these elements once

the award phase is concluded. Mexico's example illustrates how a country can promote transparency during the post-award phase by publishing post-award contract variations on Compranet, the national electronic procurement portal. This is also the case in France and Hungary where the procurement law mandates the publication of the precise conditions and content of any contract variations.

As for the *Payment of Suppliers* scores, the results also show that having a clear time within which the purchasing entity must process the payment, having payments received within 30 calendar days once the invoice is submitted and having interest and penalties automatically paid to suppliers in case of delays in payment correlate with better road quality outcomes. These results complement existing studies that show that payment delays may hinder participation.

It is worth noting that these estimations are susceptible to omitted variable bias and simultaneity given the cross-sectional nature of the data. Thus, the findings presented should be taken as correlations instead of causal relationships.

3. OECD vs non-OECD Economies

We explore whether the relationship between the quality of public procurement and road quality differs between OECD and non-OECD economies (table 6). Column 1 shows the results for OECD economies: the public procurement score is statistically insignificant. In column 2 we present the findings for non-OECD economies. The coefficient for the overall public procurement score is positive and statistically significant at the 5% level of significance. Thus, the quality of the public procurement system has a positive effect on road quality for non-OECD economies. The

implication may be that non-OECD economies have far greater needs for safeguards in the public procurement system due to weak other institutions. Improvements in public procurement regulation may have more influence on road quality in non-OECD economies than OECD economies.

In some OECD countries, compensatory mechanisms exist to ensure that the execution of procurement contracts is done in a satisfactory manner. In Australia, for example, standard procurement contracts are used and include remedies available to the purchasing entity if the supplier fails to perform its obligations under the contract. Contract managers are often tasked with rating performance and delivery of services against contract milestones. Similarly, in Ireland, key performance indicators and payment deduction mechanisms are typical instruments used to ensure satisfactory performance by suppliers. The purchasing entity takes responsibility for monitoring the supplier's performance and for implementing the compensatory mechanisms in accordance with the procurement contract.

4. Conclusions

We use a newly constructed database to evaluate public procurement regulation in 142 countries across the world. A public procurement score is constructed based on 3 key areas of the public procurement process in the eyes of potential suppliers, namely the bidding process, the content and management of the contract, and the payment of suppliers involved in public procurement. We find that the quality of public procurement regulation is correlated positively with road quality outcomes. The higher the overall score for the public procurement index, the better the road quality outcomes. Specific aspects of the public procurement –bid preparation, bid and contract management, and payment of suppliers - are also found to be strongly correlated with greater road

quality. These findings stand after accounting for the rule of law, level of development, as well as the size of the urban population in an economy.

This study is an initial step in exploring the relationship between public procurement regulation and infrastructure outcomes, and thus there are a number of limitations. First, the study is cross-sectional in nature, and thus there should be efforts to continue the collection of data on public procurement. Second, there should be an effort to collect a global data set on the cost and quality of infrastructure projects around the world. Third, the processes that generate changes in public procurement systems should be investigated. This would provide rich information on the evolution of public procurement regulation.

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Table 1: Definition and sources of variables

Variable	Definitions	Source
Quality of trade and transport-related infrastructure 1-5 (best)	Data is obtained from a survey of logistics professionals who are asked questions about the foreign countries in which they operate. The quality of trade and transport infrastructure is rated from “very low” (1) to “very high” (5).	Arvis et al., (2016). Logistics Performance Index, World Bank. http://lpi.worldbank.org/
PP Overall Index	Procurement life cycle overall score - average of scores of 3 sub-categories defined below - (i) bid preparation, (ii) bid and contract management, and (iii) payment of suppliers score	World Bank (2017) - Benchmarking Public Procurement (BPP) 2017
Bid Preparation Score	Explores elements that form part of the bid preparation phase, such as the existence of procurement portals, the cost and accessibility of relevant information, and the openness and transparency on how this preparation phase is conducted.	World Bank (2017) - Benchmarking Public Procurement (BPP) 2017
Bid and Contract Management Score	Combination of bid submission score, bid opening, evaluation and award score, and the content and management of procurement contract score. Bid submission score measures the ease of submitting bids, including the procedures and costs involved in the process and the availability of electronic means to submit the bids. It also measures that the legal framework provides a minimum time to submit the bids and regulates the amount of bid securities. Bid opening, evaluation, and award score assesses whether the bid opening, evaluation and contract award are conducted through an open and fair process in order to guarantee bidders that the process follows the best standards of transparency and that losing bidders are timely informed on the procuring entity’s decision. Content and management of procurement contract score examines the procedures involved during the execution of the contract until its completion or its termination. It also examines the existence of controls regarding modifications of the contract, including communicating those variations to other interested parties.	World Bank (2017) - Benchmarking Public Procurement (BPP) 2017
Payment of Suppliers Score	Examines whether the legal framework regulates the payment of suppliers. It also assess the time needed for the purchasing entity to start processing the payment once the invoice is submitted as well as the time in practice for suppliers to obtain payment once they submit their invoice. It also examines whether interests/penalties are paid in case of payment delays, whether they are automatic and the method for determining them	World Bank (2017) - Benchmarking Public Procurement (BPP) 2017
Rule of law	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	World Governance Indicators - WGI
Log of average precipitation in depth (mm per year)		World Development Indicators (WDI), World Bank
Log of urban population (% of total)		World Development Indicators (WDI), World Bank
Log of GDP per capita (constant 2005 US\$)		World Development Indicators (WDI), World Bank
Log of general government final consumption expenditure (% of GDP)	Total government consumption as a % of GDP	World Development Indicators (WDI), World Bank

Table 2: Pairwise Correlations of Public Procurement Scores

	PP Overall Index	Bid Preparation Score	Bid and Contract Management Score	Payment of Suppliers Score
PP Overall Index	1			
Bid Preparation Score	0.8006***	1		
Bid and Contract Management Score	0.6342***	0.3994***	1	
Payment of Suppliers Score	0.8265***	0.4985***	0.1995	1

Note: Bonferroni-adjusted significance levels, *** p<0.01, ** p<0.05, * p<0.1

Table 3: Public Procurement Performance Rankings

Country	Bid Preparation Score	Bid and Contract Management Score	Payment of Suppliers Score	PP Overall Index
United States	0.98	0.83	1.00	0.94
Italy	0.70	1.00	1.00	0.90
Spain	0.68	1.00	1.00	0.89
Denmark	0.88	0.75	1.00	0.88
Korea, Rep.	0.60	1.00	1.00	0.87
Hungary	0.80	1.00	0.76	0.85
Austria	0.78	0.87	0.85	0.83
Canada	0.98	0.77	0.75	0.83
Slovak Republic	0.90	0.83	0.75	0.83
Mexico	0.80	1.00	0.67	0.82
Australia	0.78	0.69	1.00	0.82
Estonia	0.70	0.87	0.88	0.82
Czech Republic	0.78	0.83	0.75	0.79
Romania	0.67	1.00	0.67	0.78
Ireland	0.73	0.75	0.85	0.77
Poland	0.87	0.69	0.75	0.77
Russian Federation	1.00	0.96	0.33	0.76
New Zealand	0.88	0.75	0.67	0.76
Bulgaria	0.88	0.67	0.75	0.76
Brazil	0.68	1.00	0.58	0.75
Slovenia	0.68	0.81	0.75	0.75
Georgia	0.70	0.87	0.67	0.75
Finland	0.66	0.58	1.00	0.75
Colombia	0.80	0.77	0.67	0.75
Lithuania	0.70	0.75	0.75	0.73
Guatemala	0.58	0.96	0.67	0.73
Ecuador	0.78	0.92	0.48	0.73
Luxembourg	0.67	0.75	0.75	0.72
Kazakhstan	0.70	0.96	0.50	0.72

Sweden	0.66	0.75	0.75	0.72
Costa Rica	0.70	0.87	0.58	0.72
Paraguay	0.70	0.96	0.48	0.71
Singapore	0.73	0.75	0.67	0.71
Latvia	0.68	0.69	0.75	0.71
France	0.69	0.92	0.50	0.70
China	0.56	0.87	0.67	0.70
Switzerland	0.68	0.67	0.75	0.70
Netherlands	0.78	0.56	0.75	0.70
Nepal	0.72	0.71	0.67	0.70
Panama	0.78	1.00	0.30	0.69
Japan	0.70	0.71	0.67	0.69
Croatia	0.70	0.71	0.67	0.69
Botswana	0.69	0.60	0.75	0.68
Macedonia, FYR	0.78	0.58	0.67	0.68
Norway	0.61	0.75	0.67	0.67
Albania	0.70	0.83	0.48	0.67
Sierra Leone	0.62	0.73	0.67	0.67
India	0.63	0.79	0.59	0.67
Morocco	0.69	0.83	0.48	0.67
Germany	0.76	0.56	0.67	0.66
Peru	0.80	0.67	0.50	0.66
Congo, Dem. Rep.	0.57	0.73	0.67	0.66
Cyprus	0.70	0.67	0.59	0.65
Mozambique	0.54	0.81	0.61	0.65
Burkina Faso	0.68	0.81	0.42	0.64
Greece	0.63	0.71	0.58	0.64
Belgium	0.66	0.58	0.67	0.63
Philippines	0.60	0.87	0.42	0.63
Nigeria	0.68	0.60	0.58	0.62
Uruguay	0.67	0.81	0.37	0.62
Argentina	0.70	0.77	0.37	0.61
Comoros	0.62	0.60	0.61	0.61
Ukraine	0.70	0.75	0.37	0.61
Israel	0.83	0.40	0.59	0.61
Rwanda	0.68	0.77	0.37	0.61
Bangladesh	0.60	0.79	0.42	0.61
Haiti	0.68	0.65	0.48	0.60
Mongolia	0.54	0.79	0.48	0.60
Bhutan	0.58	0.73	0.50	0.60
Pakistan	0.58	0.56	0.67	0.60
Portugal	0.58	0.56	0.67	0.60
Ethiopia	0.51	0.81	0.48	0.60
Indonesia	0.64	0.83	0.33	0.60

Gabon	0.62	0.73	0.45	0.60
Iran, Islamic Rep.	0.60	0.83	0.37	0.60
Belarus	0.70	0.58	0.50	0.59
Moldova	0.70	0.71	0.37	0.59
Egypt, Arab Rep.	0.63	0.83	0.30	0.59
Turkey	0.68	0.71	0.37	0.59
Vietnam	0.55	0.83	0.37	0.58
South Africa	0.62	0.65	0.48	0.58
Kyrgyz Republic	0.70	0.71	0.33	0.58
Iceland	0.58	0.50	0.67	0.58
Côte d'Ivoire	0.58	0.65	0.52	0.58
Tunisia	0.60	0.63	0.52	0.58
United Kingdom	0.66	0.58	0.50	0.58
Armenia	0.60	0.79	0.33	0.58
Bolivia	0.65	0.77	0.30	0.57
El Salvador	0.70	0.65	0.37	0.57
Cambodia	0.60	0.73	0.37	0.57
Cameroon	0.49	0.73	0.48	0.57
Ghana	0.56	0.56	0.58	0.57
Zambia	0.64	0.69	0.37	0.57
Nicaragua	0.80	0.56	0.33	0.57
Bosnia and Herzegovina	0.58	0.77	0.33	0.56
Mali	0.59	0.60	0.48	0.56
Chile	0.56	0.35	0.76	0.56
Afghanistan	0.56	0.77	0.33	0.55
Bahrain	0.57	0.50	0.59	0.55
Togo	0.51	0.48	0.67	0.55
United Arab Emirates	0.45	0.54	0.67	0.55
Senegal	0.56	0.60	0.48	0.55
Burundi	0.55	0.60	0.48	0.55
Kenya	0.57	0.69	0.37	0.54
Tajikistan	0.69	0.60	0.33	0.54
Niger	0.61	0.60	0.39	0.54
Thailand	0.47	0.83	0.30	0.53
Tanzania	0.58	0.65	0.37	0.53
Jamaica	0.56	0.96	0.07	0.53
Uganda	0.68	0.60	0.30	0.53
Honduras	0.54	0.65	0.39	0.53
Malaysia	0.39	0.67	0.48	0.52
Iraq	0.59	0.73	0.22	0.51
Solomon Islands	0.65	0.73	0.15	0.51
Madagascar	0.38	0.44	0.67	0.50
Chad	0.32	0.77	0.39	0.49
São Tomé and Príncipe	0.47	0.77	0.24	0.49

Oman	0.51	0.67	0.30	0.49
Venezuela, RB	0.48	0.56	0.42	0.49
Liberia	0.66	0.65	0.15	0.48
Angola	0.43	0.69	0.33	0.48
Algeria	0.42	0.35	0.67	0.48
Saudi Arabia	0.34	0.60	0.50	0.48
Lebanon	0.49	0.77	0.15	0.47
Guinea	0.49	0.60	0.30	0.46
Mauritania	0.28	0.73	0.37	0.46
Dominican Republic	0.70	0.65	0.00	0.45
Kuwait	0.53	0.65	0.15	0.44
Uzbekistan	0.42	0.52	0.37	0.44
Bahamas, The	0.50	0.44	0.33	0.42
Lesotho	0.21	0.60		0.41
Zimbabwe	0.50	0.65	0.07	0.40
Guinea-Bissau	0.40	0.44	0.36	0.40
Papua New Guinea	0.42	0.48	0.30	0.40
Lao PDR	0.32	0.65	0.15	0.37
Equatorial Guinea	0.29	0.60	0.22	0.37
Jordan	0.49	0.48	0.15	0.37
Qatar	0.38	0.60	0.07	0.35
Trinidad and Tobago	0.42	0.52	0.00	0.31
Djibouti	0.15	0.60	0.15	0.30
Namibia	0.37	0.31	0.15	0.28
Sudan	0.27	0.48	0.07	0.27

Table 4: PLC and Road quality

Dependent variable	Quality of trade and transport-related infrastructure 1-5 (best)			
	coef/se	coef/se	coef/se	coef/se
	(1)	(2)	(3)	(4)
PP Overall Index	1.214*** (0.321)	0.842*** (0.265)	0.936*** (0.272)	0.947*** (0.289)
Log of GDP per capita (constant 2005 US\$)	0.367*** (0.044)	0.175*** (0.058)	0.193*** (0.062)	0.172** (0.072)
Rule of law		0.355*** (0.075)	0.357*** (0.074)	0.397*** (0.085)
Log of average precipitation in depth (mm per year)			-0.074 (0.062)	-0.089 (0.069)
Log of urban population (% of total)			-0.101 (0.093)	-0.105 (0.101)
Log of general government final consumption expenditure (% of GDP)				-0.062 (0.104)
regiongrp==East Asia & Pacific	-0.041 (0.123)	-0.005 (0.127)	0.080 (0.159)	0.093 (0.172)
regiongrp==Europe & Central Asia	-0.265*** (0.087)	-0.187*** (0.071)	-0.157** (0.073)	-0.135* (0.080)
regiongrp==Latin America & Caribbean	-0.560*** (0.104)	-0.298** (0.122)	-0.179 (0.138)	-0.173 (0.151)
regiongrp==Middle East & North Africa	-0.160 (0.141)	0.023 (0.138)	-0.019 (0.162)	-0.019 (0.168)
regiongrp==South Asia	0.003 (0.246)	0.002 (0.248)	0.041 (0.240)	0.031 (0.253)
regiongrp==Sub-Saharan Africa	-0.019 (0.183)	-0.016 (0.150)	0.037 (0.150)	0.073 (0.176)
Constant	-0.898** (0.370)	0.883* (0.534)	1.517** (0.670)	1.960** (0.841)
Number of observations	142	142	142	130
Adjusted R2	0.696	0.765	0.767	0.760

note: *** p<0.01, ** p<0.05, * p<0.1

Table 5: Public Procurement subcategories and Road quality

	Quality of trade and transport-related infrastructure 1-5 (best)			
	coef/se	coef/se	coef/se	coef/se
	(1)	(2)	(3)	(4)
PP Overall Index	0.936*** (0.272)			
Bid Preparation Score		0.635** (0.279)		
Bid and Contract Management Score			0.490** (0.206)	
Payment of Suppliers Score				0.359** (0.149)
Log of GDP per capita (constant 2005 US\$)	0.193*** (0.062)	0.199*** (0.065)	0.175*** (0.067)	0.186*** (0.067)
Rule of law	0.357*** (0.074)	0.365*** (0.076)	0.414*** (0.078)	0.359*** (0.078)
Log of average precipitation in depth (mm per year)	-0.074 (0.062)	-0.079 (0.061)	-0.071 (0.066)	-0.065 (0.064)
Log of urban population (% of total)	-0.101 (0.093)	-0.073 (0.099)	-0.051 (0.101)	-0.088 (0.105)
regiongrp==East Asia & Pacific	0.080 (0.159)	0.119 (0.190)	-0.082 (0.149)	-0.050 (0.148)
regiongrp==Europe & Central Asia	-0.157** (0.073)	-0.135 (0.108)	-0.254*** (0.076)	-0.254*** (0.068)
regiongrp==Latin America & Caribbean	-0.179 (0.138)	-0.195 (0.158)	-0.318** (0.136)	-0.289** (0.140)
regiongrp==Middle East & North Africa	-0.019 (0.162)	-0.063 (0.187)	-0.212 (0.148)	-0.188 (0.143)
regiongrp==South Asia	0.041 (0.240)	0.100 (0.259)	-0.055 (0.256)	-0.094 (0.242)
regiongrp==Sub-Saharan Africa	0.037 (0.150)	0.060 (0.186)	-0.108 (0.152)	-0.132 (0.142)
Constant	1.517** (0.670)	1.557** (0.720)	1.813*** (0.692)	1.983*** (0.695)
Number of observations	142	142	142	141
Adjusted R2	0.767	0.760	0.759	0.759

note: *** p<0.01, ** p<0.05, * p<0.1

Table 6: Sample divided between OECD Economies and non-OECD economies

Dependent variable	Quality of trade and transport-related infrastructure 1-5 (best)	
	OECD economies	Non-OECD economies
	coef/se (1)	coef/se (2)
PP Overall Index	-0.181 (0.760)	1.113*** (0.317)
Log of GDP per capita (constant 2005 US\$)	0.604*** (0.195)	0.158*** (0.060)
Rule of law	-0.055 (0.113)	0.349*** (0.079)
Log of average precipitation in depth (mm per year)	-0.309 (0.325)	-0.099 (0.076)
Log of urban population (% of total)	0.248 (0.627)	-0.103 (0.093)
regiongrp==East Asia & Pacific	-0.006 (0.359)	0.159 (0.261)
regiongrp==Europe & Central Asia	-0.116 (0.131)	-0.302 (0.227)
regiongrp==Latin America & Caribbean	-0.375 (0.411)	-0.128 (0.238)
regiongrp==Middle East & North Africa	-0.620*** (0.239)	-0.007 (0.283)
regiongrp==Sub-Saharan Africa	(dropped)	0.007 (0.210)
Constant	-1.246 (3.461)	1.866*** (0.683)
Number of observations	34	108
Adjusted R2	0.578	0.569

note: *** p<0.01, ** p<0.05, * p<0.1

Table A1: Scoring Sheet

Bid Preparation Score	
Does the procuring entity organize a consultation with the private sector to assess its needs (please refer to the case study above)?	Y=1/N=0
Is consultation with the private sector, if organized by the procuring entity, publicly advertised?	Y=1
Are there internal market analysis guidelines during the phase of market research?	Y=1
Is open tendering the default method of procurement in your country	Y=1
Is there one or several procurement portal(s) (i.e. an official website(s) specifically and exclusively dedicated to public procurement) in operation in your country	Y=1/N=0
Is the following material publicly accessible online?: Procurement plans	Y=1/5
Public procurement laws and regulations (available online)	Y=1/5
Notices of calls for tender (available online)	Y=1/5
Tender documents (available online)	Y=1/5
Notice of award / bidding results (available online)	Y=1/5
Are the following elements included in the tender notice and/or tender documents?: Technical and financial qualifications that bidders must meet	Y=1/8
Grounds for exclusion of bidders	Y=1/8
Amount of bid security, if any	Y=1/8
Form(s) of bid security, if any	Y=1/8
Criteria against which bids will be evaluated	Y=1/8
Method used to assess bids (e.g. weight allocated to each criteria during the bid assessment.)	Y=1/8
Main terms and conditions of the contract	Y=1/8
Payment schedule under the procurement contract	Y=1/8
Are tender documents accessible for free?	Y=1
Do bidders have the opportunity to ask a question for clarification to the procuring entity (either through regular channels of communication or during a clarification meeting with bidders organized by the procuring entity)?	Y=1
Is there a timeframe for the procuring entity to address bidders' questions?	Y=0.5
Are answers provided by the procuring entity made available to all interested bidders (either by sending the responses to all bidders or publishing them or, if questions are addressed during a meeting, by making the minutes of the meeting available to all bidders)?	Y=0.5

Bid and Contract Management	
Question	Scoring rule
Are foreign firms eligible to submit bids in response to calls for tender in country	Y=1

Is there a minimum period of time (calendar days) that the procuring entity must grant bidders for them to submit their bids?	Y=1
How can bidder submit bids?: Via an electronic procurement platform	Y=0.5
Form of bid guarantee: Bid security	Y=0.5
Forms of bid security: Cash deposit	Y=1/3
Bank guarantee	Y=1/3
Insurance guarantee	Y=1/3
Do suppliers have the choice regarding the form of bid security instruments	Y=1/N=0
What are the criteria considered in order to evaluate the bids?: Price and other qualitative elements	Y=1
Are there model contracts with standard clauses that the purchasing entity uses when awarding a contract?	Y=1
Does the purchasing entity have the obligation to: Publish post-award contract variations	Y=1

Payment of Suppliers Score	
Would the supplier have the possibility, through an online platform (an e-procurement platform or an online payment system), to request a payment online?	Y=1
Does the legal framework provide a time within which the purchasing entity must process the payment?	Yes and less than 31 days=1, Yes but more than or equal to 31 days= 0.5, No=0
Does it mention that the mandated timeframe to process the payment starts running from the submission of the invoice by the supplier?	Y=1
How long does it take the supplier to actually receive payment once the invoice is submitted (in calendar days)?:	Y=1
Between 0 and 30	
Between 31 and 90	Y=0.66
Between 91 and 180	Y=0.33
More than 181	Y=0
Are there any interests and/or penalties payable to suppliers in case of delays in payment?	Y=1
If interests and/or penalties are payable to suppliers in case of delays in payment, are they automatically paid without a request from the supplier?	Y=0.5

Table A2: Summary statistics

	Obs	Mean	Std. Dev.	Min	Max
Quality of trade and transport-related infrastructure 1-5 (best)	142	2.795	0.721	1.470	4.440
PLC overall score	142	0.610	0.133	0.274	0.938
Bid Preparation Score	142	0.617	0.150	0.150	1.000
Bid and Contract Management Score Bid Submission Score	142	0.707	0.149	0.313	1.000
Payment of Suppliers Score	141	0.505	0.227	0.000	1.000
Log of average precipitation in depth (mm per year)	142	6.687	0.921	3.932	8.083
Log of urban population (% of total)	142	3.989	0.486	2.146	4.605
Log of GDP per capita (constant 2005 US\$)	142	2.722	0.357	1.675	3.371
Log of general government final consumption expenditure (% of GDP)	130	8.592	1.536	5.404	11.551

Figures:

Figure 1: PP and Income

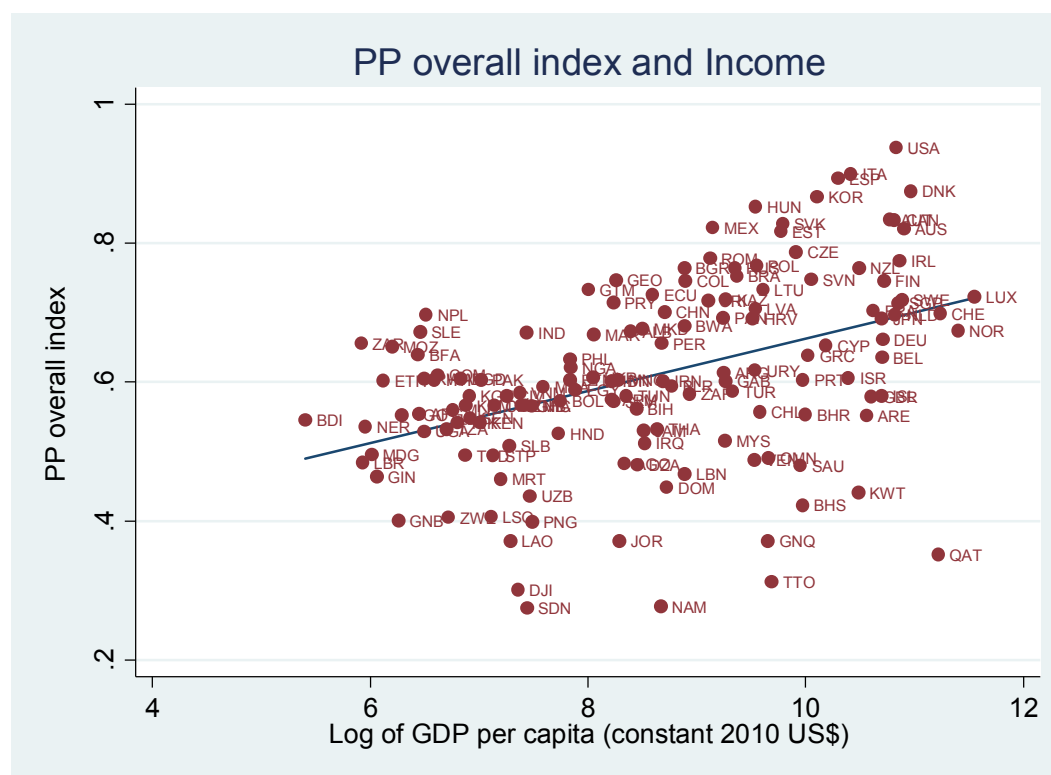


Figure 2: PP and road quality

