Public Procurement in Law and Practice[1]

Erica Bosio

Simeon Djankov

Edward Glaeser

Andrei Shleifer

October 2021

Abstract

We examine a new dataset of public procurement laws, practice, and outcomes in 187 countries. We measure regulation as restrictions on the discretion of the procuring entities. We find that laws and practice are highly correlated with each other across countries, and better practice are correlated with better outcomes, but laws themselves are not correlated with outcomes. A closer look shows that stricter laws correlate with improved outcomes, but only in countries with low public sector capacity. We present a model of procurement in which both regulatory rules and public sector capacity determine procurement outcomes. In the model, regulation is effective in countries with low public sector capacity, but not in countries with high capacity because it inhibits the socially optimal exercise of discretion to exclude low quality bidders.

I. Introduction

The world spent $11 trillion on public procurement in 2019, amounting to 12 percent of global GDP. This percentage is even higher in richer countries. Procurement is a primary channel through which public dollars pass into private hands, and as such is particularly vulnerable to misconduct. Private contractors have strong incentives to bribe public officials to increase payments, to cut out competitors, or to accept inferior quality. The challenges of renegotiation and non-verifiable quality that appear in private contracting also bedevil public procurement (Hart and Moore 1988; Hart, Shleifer, and Vishny 1997). But unlike many large private buyers, public agencies often lack the incentives and administrative capacity to handle these challenges.

The vulnerability of public buyers to private subversion has led every country to restrict the discretion of procuring entities in what they buy and pay. But while the regulation of the private sector empowers public officials and enables them to extract bribes in exchange for regulatory relief (Djankov et al. 2003a), the regulation of government constrains public officials. Public procurement regulations reduce the discretion of buyers, typically with the intent of reducing corruption. But what do they really accomplish?

We provide an overview of procurement laws and practice in 187 countries. Data was collected through expert surveys. Respondents in each country (typically three to six professionals ranging from public procurement lawyers to road construction companies and procuring entities) are presented with a hypothetical $2.5 million road maintenance project and asked about the rules that would govern its procurement. Based on their answers, we construct measures of laws governing procurement, which cover transparency, competition, exclusion of bidders, and integrity of contracts. Respondents also describe whether and how procurement practice differs from the laws, so we create corresponding measures of regulatory practice. In some instances, practice does not follow the requirements of the law; in others procurement entities go further than the requirements of the law, for instance with transparency. We also construct measures of procurement outcomes, including assessments of process Integrity (including corruption, favoritism, collusion, and absence of competition) and product Quality (including time delays, cost overruns, and low product quality). In section II, we describe the survey and how we aggregate the answers to create indices of regulation in law and practice, and of Integrity and Quality of outcomes.

Section III presents several novel facts in these data. We find that the strictness of laws governing procurement falls with GDP per capita, but the strictness of regulatory practice increases. Nonetheless, the indices of laws and practice are highly correlated with each other. With respect to outcomes, we find, not surprisingly, that richer and higher public sector capacity countries have higher Integrity and Quality of procurement. The survey measures are also correlated with two external measures of road quality: the World Economic Forum's (WEF) (2019) survey question on the quality of roads in a country, and the average night driving speeds between the north and south end of the three largest cities in each country calculated using Google Maps. These measures of road quality also rise with income.

We further document that stricter procurement practice is strongly positively correlated with both Integrity and Quality. Stricter laws, however, are not. This evidence raises a puzzle: laws predict practice; practice predicts outcomes; but laws do not predict outcomes. To shed light on this puzzle, we establish two further facts. First, we show that stricter laws are positively associated with better outcomes in poorer and lower public sector capacity (henceforth PSC) countries, but negatively associated with better outcomes in richer and higher PSC ones. Second, we show that laws tend to be stricter than practice in lower PSC countries, but less strict than practice in higher PSC ones.

Motivated by these facts, section IV proposes a model of regulation of public procurement. The model considers a simple infrastructure project in which a procuring entity (PE) faces two bidders with different costs and quality levels. One bidder is an *insider*, who can engage in corrupt bargaining with the PE; the other is an *outsider*, who is bound by an external constraint, such as the U.S. Foreign Corrupt Practice Act, not to bribe. We compare two institutional settings: regulation and discretion. Under regulation, the PE must run a second price auction and accept the low bid regardless of the quality level. Under discretion, the PE can exclude a bidder based on alleged lower quality. Because quality is not externally verifiable, the PE can exclude the higher-quality outsider in exchange for a bribe from the insider.

We assume that the PE maximizes a weighted average of social welfare and bribes, and that the weight the PE places on social welfare rises with PSC. We also assume that corruption is costlier in higher PSC countries. In a low PSC country, it may be easy to bribe with cash. In a higher PSC country, bribes may take the form of favors valued by the PE at less than their cost.

In this model, the advantage of discretion by law is that it enables the PE to eliminate low-quality bidders in practice. The advantage of limiting discretion by law is that doing so prevents the PE in practice from excluding a high-quality outsider in exchange for a bribe from the insider. When PSC is high, discretion dominates regulation, because the PE excludes only low-quality bidders from the auction. When PSC is low, regulation dominates discretion, because discretion in law leads to corruption in practice.

In section V, we summarize the predictions of the model, and connect them back to the empirical findings in Section III. We use human capital as our proxy for PSC, but our results are very similar if we use more direct measures of government effectiveness and quality. The model implies that practice is more restrictive than laws in high PSC countries, and vice versa in low PSC ones, consistent with the evidence. The model also explains the key finding that laws are positively correlated with outcomes in low PSC countries and negatively in high PSC ones. Low PSC countries lack the administrative capacity to benefit from discretion in procurement.

Section VI concludes. Procuring entities are typically highly regulated, but these regulations are generally not associated with improvements in Integrity and Quality. This presents a puzzle because laws predict practice and practice predicts outcomes, but laws do not predict outcomes. The resolution of this puzzle is that the overall relationship between laws and outcomes misses a critical heterogeneity. Constraints on bureaucratic freedom improve outcomes when PSC is low, and harm outcomes when PSC is high. Contrary to a standard view that laws and PSC are complements because an effective public sector is needed to enforce laws, we show in the case of procurement that public sector capacity and the regulation of government are substitutes. The regulation of procurement helps, but only in poor countries where discretion leads to corruption.

Literature Review

This paper contributes to several strands of a large literature on government procurement and performance. Public procurement has been found to suffer from bid rigging (Porter and Zona 1993, Conley and Decarolis 2016), cost overruns (Flyvbjerg, Skamris, and Buhl 2003), favoritism toward politically connected bidders (Burgess et al. 2015, Mironov and Zhuravskaya 2016, Baranek and Titl 2020), lack of transparency (Coviello and Gagliarducci 2014), collusion between politicians and firms (Coviello and Gagliarducci 2017), and simply bad choices (Bandiera, Prat, and Valletti 2009). Corruption has also been found to be common in procurement (Di Tella and

4

Schargrodsky 2003, Olken 2007, Collier et al. 2016, Colonnelli and Prem 2020, Lichand and Fernandes 2019), particularly when contracts are renegotiated (Decarolis 2014, Decarolis and Palumbo 2015, Campos et al. 2019). Our data cover the prevalence of cost overruns, favoritism, collusion, and corruption in procurement.

The tradeoff between rules and discretion has been central to research on procurement. Kelman (1990) stresses the costs of rigid regulations in US government procurement and makes the case for discretion. Recently, research on the potential benefits of discretion has progressed rapidly (Spagnolo 2012; Duflo et al. 2018; Coviello et al. 2018; Rasul and Rogger 2018; Rasul et al. 2019; Best et al. 2019; Baltrunaite et al. 2020; Bandiera et al. 2020; Decarolis et al. 2020a; Decarolis et al. 2020b). We follow these papers in identifying the benefits of both bureaucratic discretion and regulation. We do not have the compelling sources of exogenous variation found in other studies, but our geographic and theoretical focus is broader, as we cover 187 countries and the complete path of the procurement process.

We also follow the literature that connects public sector capacity with education across countries (Barro 1999; La Porta, Lopez-de-Silanes, and Shleifer 1999; Milligan, Moretti, and Oreopoulus 2004; Glaeser, Ponzetto, and Shleifer 2007; Pande 2011; Botero, Ponce, and Shleifer 2013; Decarolis et al. 2019). The interaction between the quality of public employees and the benefits of regulating them is a central theme of our paper.

Our paper is also linked to research on regulation around the world (Djankov et al. 2002, 2003a,b, 2008a,b; Botero et al. 2004). We show that the factors that shape the regulation of government are different from those that shape the regulation of the private sector.

Last, we contribute to the literature on corruption. Theoretical studies have focused on determinants of corrupt behavior (Banfield 1975, Shleifer and Vishny 1993, Banerjee 1997). Empirical studies have focused on the magnitude of corruption (Svensson 2003, Sequeira and Djankov 2014, Olken et al. 2018), political connections as channels for corruption (Fisman 2001, Faccio 2006), transparency of politicians' incomes as a barrier to corruption (Djankov et al. 2010; Banerjee, Hanna, and Mullainathan 2012), or administrative design to reduce bribes (Bertrand et al. 2007, Duflo, Hanna, and Ryan 2012). We show that corruption is reduced by regulatory constraints on the behavior of procuring entities both by law and in practice.

II. Data

Case Study

The analysis in this paper is based on data collected through expert surveys on the regulation of public procurement in 187 countries in 2019. In this section we describe the survey, its respondents, and the variables we construct. The survey is based on a fictitious case study of a government agency procuring bids for road resurfacing work. The type of work was determined through a World Bank study of 1,800 road-related projects in 89 countries over two decades, the Road Cost Knowledge System (ROCKS, Bosio et al. 2018). We use the ROCKS database to describe our case facts.

The survey respondents are presented with detailed assumptions on the contract, the road, the procuring entity, the bidder, and the procurement process. The contract entails the resurfacing of 20 km of a two-lane flat road with an asphalt overlay of 40 to 59 mm (or its most common equivalent in the country). The road connects the economy's largest business city to another city in the same state, region, or province and is neither a highway nor operated under concession. The value of the contract is $2,500,000. Appendix A describes how this value was calculated.

For our 187 countries, the hypothetical case we present is subject to the regulations we codify for public works contracts in the range of $250,000 to $5,000,000 with NO exceptions. The regulations in fact are applicable for all contract sizes in 123 sample countries. In 16 countries, (15 high income and 1 middle-income), some stricter rules apply for larger-size contracts (above $5,000,000). In Appendix A, we show that the relationship between laws and outcomes remains insignificant without these countries (Figures A3 and A4). In 29% of the sample (54 countries) no rules or simpler rules apply for small (below $250,000) contracts.

For 82 countries in the sample, we also collected data on the actual value of road resurfacing and found that the median value of a two-lane twenty-kilometer road resurfacing project is $4,698,659. While there is a wide distribution, road resurfacing tends to be more expensive in low-income countries. None of these 82 countries fall into the lower or upper limit of countries which by law have different rules than the ones coded in our case study. In other words, the coded law applies to all countries for our case facts. Appendix A further details this analysis.

The PE choosing the contractor for this project is a government agency, typically the Ministry of Transportation, and is the sole financer of the work. To make the case study comparable across countries, the contract is assumed to be tendered through an open, unrestricted, and competitive public call for tenders. The process ends with the contract awarded to "BidCo," whose bid satisfies all technical and administrative criteria. BidCo is a privately, domestically owned medium-sized limited liability company (or its most common legal equivalent) that operates in the economy's largest business city, is in good standing with all relevant authorities, and has all the licenses and permits required to operate.

The hypothetical contract abstracts from a number of issues important in public procurement. It focuses exclusively on procurement of works and excludes the procurement of services and goods. To exclude roads operated under concession, the road cannot be a highway. The road cannot be a street within the boundaries of a city because many cities around the world would not conduct open tendering for such a contract but rather do it in-house or through direct award. Our data underestimate the complexity of public procurement by assuming that the work is procured through an open, competitive tendering procedure in which any qualified company can submit an economic offer. All other types of procurement (e.g., direct award, framework agreements, negotiated procedures, restricted tendering) are excluded by design. BidCo has already worked with the PE and participated in similar bidding processes in the past 5 years. This assumption eliminates the preregistration process common in many countries.

The Questionnaire

The data on the road resurfacing case study was collected in two rounds, in 2018 and 2019, through questionnaires disseminated by the World Bank's team to 191 countries. Four countries (Antigua and Barbuda, Libya, the Maldives, and Syria) did not complete an open tendering procurement procedure for road work in the past 5 years and are excluded from the analysis. The final sample comprises three groups of 58 high-income, 53 upper-middle-income, and 76 low- and lower-middle-income countries.

The questionnaire was completed by more than 1,200 professionals involved in the procurement activity, including lawyers, construction, and engineering firms, and procuring

entities. In each country, we only consulted with professionals who had been involved in procurement of works contracts with the relevant PE over the previous 12 months. Appendix Figure A1 shows the distribution of countries by number of experts. Whenever possible, we compared answers from people in the same country and collected all the pertinent legal documents that the respondents identified. Lawyers answered primarily questions related to the legal framework. Construction and engineering firms answered questions about practice, defined as the actual application of public procurement regulation. These experts were also essential for us to understand phases of the project in which lawyers are less involved (e.g., quality control, inspections, and payments). PEs reported on both laws and practice. The World Bank team then contacted different respondents in a country to reconcile their answers, which sometimes differed because of misunderstandings. For numeric answers, we take the median response.

The questionnaire had four parts, following the main chronological stages of the typical public procurement process: prebidding, bidding, execution, and payment. In each part, respondents were presented with four types of requests: (1) indicate which rules regulate each stage of public procurement; (2) outline the procedures that would be followed in the award and execution of a contract for the resurfacing of a flat two-lane road; (3) indicate how long each procedure would take; and (4) answer multiple-choice questions on the frequency of certain occurrences in public procurement, such as collusion or bribery.

The questionnaire is organized both chronologically, to facilitate the respondents' thinking about the public procurement process, and around the following four themes (Table 1): transparency—the level of public availability of key documents; competition—what rules are in place to broaden participation in the tendering process; limits to exclusion—whether there are rules in place making it more difficult for the PE to exclude bidders without justifying the exclusion or publishing the reasons; and the integrity of the contract—events that may take place during the life of the contract, such as payment, the ability to add subcontractors, renegotiation after the contract is signed, and changes in project specifications. Appendix A describes the construction of the variables in detail, with illustrations and examples.

Table 1: Regulation of Procurement by law and in practice

TRANSPARENCY	
LAW	**PRACTICE**
By law, do procurement plans need to be made publicly available by the procuring entity (PE)?	In practice, are procurement plans made publicly available by the procuring entity in more than 50% of cases?
By law, do model procurement documents and materials / standard contract conditions need to be made publicly available by the PE?	In practice, are model procurement documents and materials / standard contract conditions made publicly available by the PE in more than 50% of cases?
By law, do tender notices need to be made publicly available by the PE?	In practice, are tender notices made publicly available by the PE in more than 50% of cases?
By law, do tender documents and technical specifications need to be made publicly available by the PE?	In practice, are tender documents and technical specifications made publicly available by the PE in more than 50% of cases?
By law, do notices of award / bidding results need to be made publicly available by the PE?	In practice, are notices of award / bidding results made publicly available by the PE in more than 50% of cases?
By law, does the contract need to be made publicly available by the PE?	In practice, are contracts made publicly available by the PE in more than 50% of cases?
By law, does the legal framework regulate the need to make contract renegotiations publicly available?	In practice, are the results of contract renegotiations made publicly available in more than 50% of cases?
COMPETITION	
LAW	**PRACTICE**
According to the legal framework, is open tendering the default method of procurement for a contract like the one described in our case study?	In practice, is open tendering the most common method of procurement for a contract like the one described in our case study?
According to the legal framework, after the advertisement of an open tendering procedure, can the PE require bidders to participate in a prequalification process before submitting an economic offer?	In practice, does the PE avoid requiring bidders to participate in a prequalification process?
Does the legal framework prohibit dividing contracts to circumvent thresholds for open tendering?	In practice, does the PE avoid dividing contracts to circumvent thresholds for open tendering?
According to the legal framework, is there a minimum time limit between the advertisement of the tender notice and the submission deadline for an open tendering procedure like the one described in our case study?	In practice, does the PE advertise procurement opportunities long enough to maximize competition?
Does the legal framework require the procuring entity to proceed to bid opening immediately after the deadline for bid submission has been reached?	In practice, is bid opening carried out immediately?
Is there a standstill (or pause) period between public notice of award and contract signing to allow unsuccessful bidders to challenge the award decision that suspends the procurement process?	In practice, does the filing of a complaint against the award suspend the procurement process?
LIMITS TO EXCLUSION	
LAW	**PRACTICE**
Does the legal framework establish the minimum content of the tender notice and tender documents?	In practice, does the PE avoid defining technical specifications to benefit a specific bidder?
Is the PE required to make clarifications provided to bidders publicly available?	In practice, does the PE avoid informal meetings with individual bidders?

According to the legal framework, is price the award criterion to be used by the PE for a contract like the one described in our case study?	In practice, how often is the award decision based solely on price and not on best value for money?
Does the legal framework establish a criterion to identify abnormally low bids?	In practice, do bidders avoid submitting recklessly low bids to win the tender?
Does the legal framework define what constitutes a nonsubstantial error?	In practice, if a bidder submits a bid with a nonsubstantial error, is it given the opportunity to rectify such error before disqualification?
INTEGRITY OF CONTRACT	
LAW	**PRACTICE**
Is the procuring entity required to have already allocated budget to a specific project before tendering?	In an open tendering procedure, does the PE award a contract after having already set aside all the necessary funds?
Does the law regulate the selection, disclosure, and liability of subcontractors?	Does BidCo avoid employing subcontractors that were neither properly selected nor disclosed during the tender process?
By law, can additional work be procured through direct award?	In practice, is the use of direct awards to procure additional work avoided?
Does the law regulate the scope, limits, and disclosure of contract renegotiations?	Does BidCo avoid using the renegotiation process to increase the price or the scope of the project without another competitive process?
During the execution of the contract, does the legal framework establish a timeframe within which the PE must process payment once an invoice is received?	In practice, does BidCo receive payment within the timeframe established by the legal framework?
According to the legal framework, is the company entitled to claim interest on late payments if the PE does not pay within the legally established timeframe?	In practice, does BidCo receive interest on late payment?

We ask questions about both the laws regulating procurement and actual practice. The questions about laws elicit information about each country's rules governing the process. The answers describe the ways the regulations reduce the discretion of the PE. More specifically, "laws" refers to the body of instruments (laws, acts, regulations, etc.) that regulate the entire procurement process (from needs assessment to post-tendering). We code as "laws" all legal instruments that are procurement-specific and mandatory. Guidelines are not included if they are self-imposed by the procuring entity or are for "recommended" use. Standard bidding documents and model contracts are considered as "laws" when they are for mandatory use or when a departure from them would have to be justified by the procuring entity.

The questions about practice mirror those about laws to gauge their actual application. The coding of practice parallels that of laws: the less discretion the PE can exercise, the higher the

practice score. As an example, the questionnaire asks whether, by law, the PE is required to publish tender notices and documents online. The corresponding questions about practice ask whether these notices and documents are indeed published. If such publication is meant to be online, the team checks whether this happens by visiting the relevant platforms or websites. Other practice questions measure the frequency of applying a particular provision in the law. For example, the questionnaire asks whether, by law, open tendering is the default method of procurement. The mirror practice question asks how often open tendering is used to procure road resurfacing work.

In our 187-country sample, 117 countries have standard documents or contract terms that are of mandatory use, which we code as part of the "laws". Fifty-three countries have no such documents, and the remaining 17 countries have standard documents or contract terms that are not of mandatory application. Appendix A shows that if, for these 17 countries, we recode standard practice as mandatory, our results are robust.

The law and practice indices are sums of the four themes or subindices and are scored between 0 and 4, with higher values representing more regulation or less discretion. On the laws index, Rwanda scores highest (3.35 out of 4), followed by Cabo Verde (3.26) and Hong Kong, China (3.17). At the other end, Belize scores 0.31, followed by Barbados (0.48), and St. Vincent and the Grenadines (0.5). On the practice index, Estonia scores highest with 3.38, followed by Hong Kong (3.24) and Slovenia (3.21). At the other end, Palau scores 0.37, followed by South Sudan (0.48) and Venezuela (0.5).

The questionnaire also elicits expert opinions about outcomes. We convert these answers into two outcome variables (their construction is described in Appendix A): Quality and Integrity (see Table 2). Quality reflects the time to completion, cost overruns, and the quality of the works. Integrity covers favoritism, bribes, collusion, and the absence of competition in procurement.[2] We code the inputs into the measures of outcomes literally, so higher scores indicate better outcomes (e.g., less corruption, fewer delays, smaller cost overruns).

---

[2] In July 2021, the Global Transparency Institute in collaboration with the World Bank released and made publicly available a new Integrity measure based on a large sample of procurement contracts (Fazekas, 2021). We describe this variable, which is similar to our own, in Appendix A. The index measures favoritism and corruption in actual public procurement contracts. The index construction is based on a dataset of 1.2 million construction contracts awarded after the year 2000 in 171 countries. Only contracts worth $100,000 or more are considered.

Table 2: Outcome variables: Quality, Integrity, and Road Quality

Outcome Variables		
Quality	*Time*	The time that it takes in calendar days from the moment the procuring entity decides to procure road works until the winning bidder can commence the works as well as the delays associated with contract management.
	Overruns	How often are the works delivered within the original budget?
	Project Quality	How often do private sector companies execute the contract with less quality or with different technical specifications than were submitted during the tender process?
Integrity	*Favoritism*	How often do procuring entities circumvent public procurement rules by interpreting selection criteria in a way that favors a specific bidder?
	Bribes	How often do private sector companies informally pay public officials to circumvent public procurement rules?
	Collusion	How often do private sector companies collude with the Procuring Entity, to negate market entry to other competitors?
	No competition	How often do procuring entities use non-competitive procurement methods instead of open tendering to restrict market entry?
Aspeed	Measures the nighttime (3am start) average travel speed (Aspeed) between the north and south end of the three largest cities in each country using Google Maps Distance Matrix API. The north point of the city is defined as 0.1 latitude north of the coordinates given for the city center; south as 0.1 latitude south of coordinates given for the city center. Highways are excluded where possible.	
Road Quality WEF	In your country, how is the quality (extensiveness and condition) of road infrastructure [1 = extremely poor—among the worst in the world; 7 = extremely good—among the best in the world]?	

The scoring of outcomes leads to an unsurprising list of worst and best countries. On quality, the worst are Venezuela, São Tomé and Príncipe, and Haiti; the best are Singapore, Switzerland, and Korea, Rep. On integrity, Lao PDR, Myanmar and Niger are the worst performers, while the best are Australia, Dominica and Estonia. We next turn to analyzing these data.

III. Correlations in the Data

In this section we establish some key correlations in the data. In Appendix B, we examine the robustness of these correlations in regressions with controls. In Appendix C, we consider subindices of our indices of laws and practice. We begin by showing how our aggregate indices of laws and practice vary with per capita income (Figures 1 and 2). The evidence is clear: laws become less stringent as per capita income rises, but practice becomes more stringent. Poorer countries have tougher rules on the books; richer countries have more restrictive procurement practice. As we noted in Section II, this is not just a consequence of differential coding in rich and poor countries: even if we take the customary restrictions on PEs that do not appear in laws but in other documents, the relationship in Figure 1 holds.

Figure 1. Laws and Income per Capita

$n = 187$ RMSE = 0.650
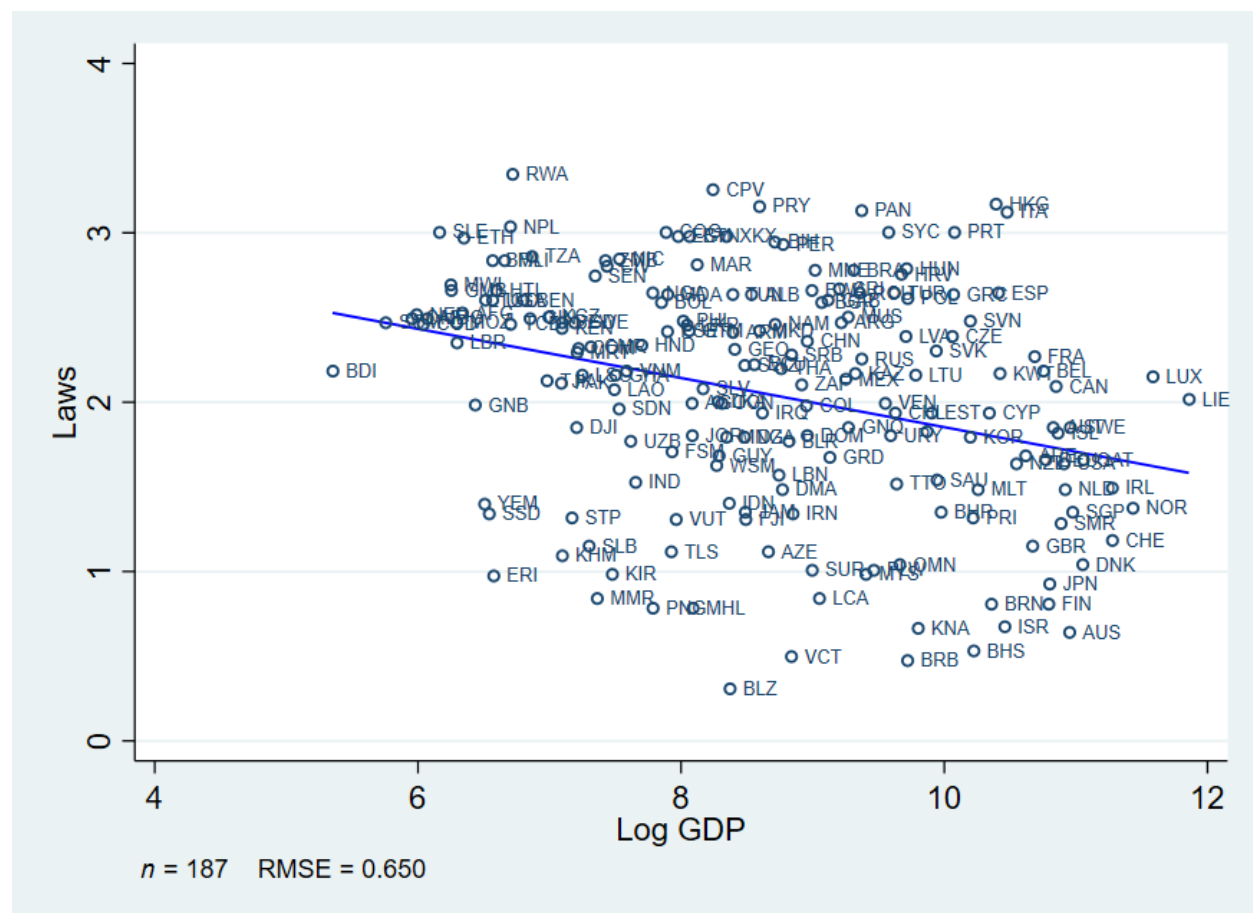
Figure 2. Practice and Income per Capita
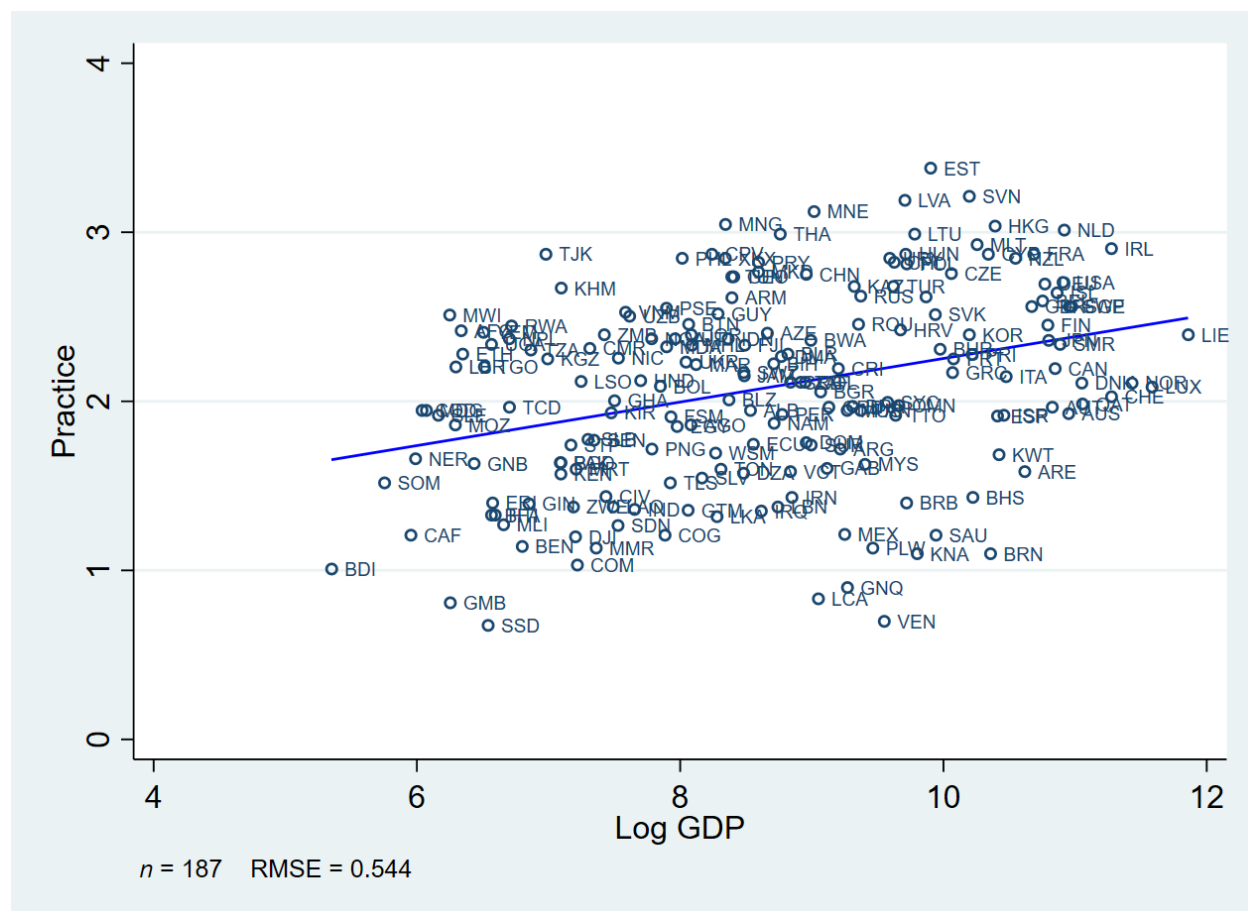
Procurement laws and practice are also correlated with each other across countries:

$$Practice = \underset{(.06)}{.27} \cdot Laws + \underset{(.03)}{.17} \cdot Log(GDP) + \underset{(.30)}{0.07}$$

The R-squared for the 187 observations is 0.20. Both income and laws play a large role in explaining the variation of regulatory practice across countries.

Table 3 presents the correlations between Integrity and Quality of procurement, our measures of laws and practice, as well as log per capita GDP and the two external outcomes: the World Economic Forum (2019) survey measure of road quality and the average night speeds between the north and south end of the three largest cities in each country calculated using Google Maps and avoiding highways whenever possible. The two outcomes from our data are highly correlated with each other across countries and are better in richer countries. The two external measures of road quality are also correlated with our survey measures and with log GDP. These outcomes are also

correlated with the practice of procurement regulation. Both Integrity and Quality are robustly positively correlated with practice. In contrast, the correlations with the laws are weak: countries with more legal controls on PEs do not have better outcomes, and sometimes, as in the case of Integrity, Road Quality and Aspeed, have worse ones.

Table 3: Correlations between laws, practice, and outcomes.

	Integrity	Quality	Road Quality WEF	Aspeed	Log GDP	Laws	Practice
Integrity	1						
Quality	0.576***	1					
Road Quality WEF	0.479***	0.434***	1				
Aspeed	0.247***	0.149**	0.335***	1			
Log GDP	0.558***	0.458***	0.688***	0.438***	1		
Laws	-0.181**	-0.0685	-0.391***	-0.320***	-0.315***	1	
Practice	0.552***	0.531***	0.142*	0.109	0.332***	0.185**	1

Figures 3 and 4 illustrate the relationship between procurement practice, Integrity, and Quality. The results are not surprising: both outcome variables improve with better practice of procurement. There is a clear benefit of stricter procurement practice evident in the data.

Figure 3. Integrity and Regulatory Practice
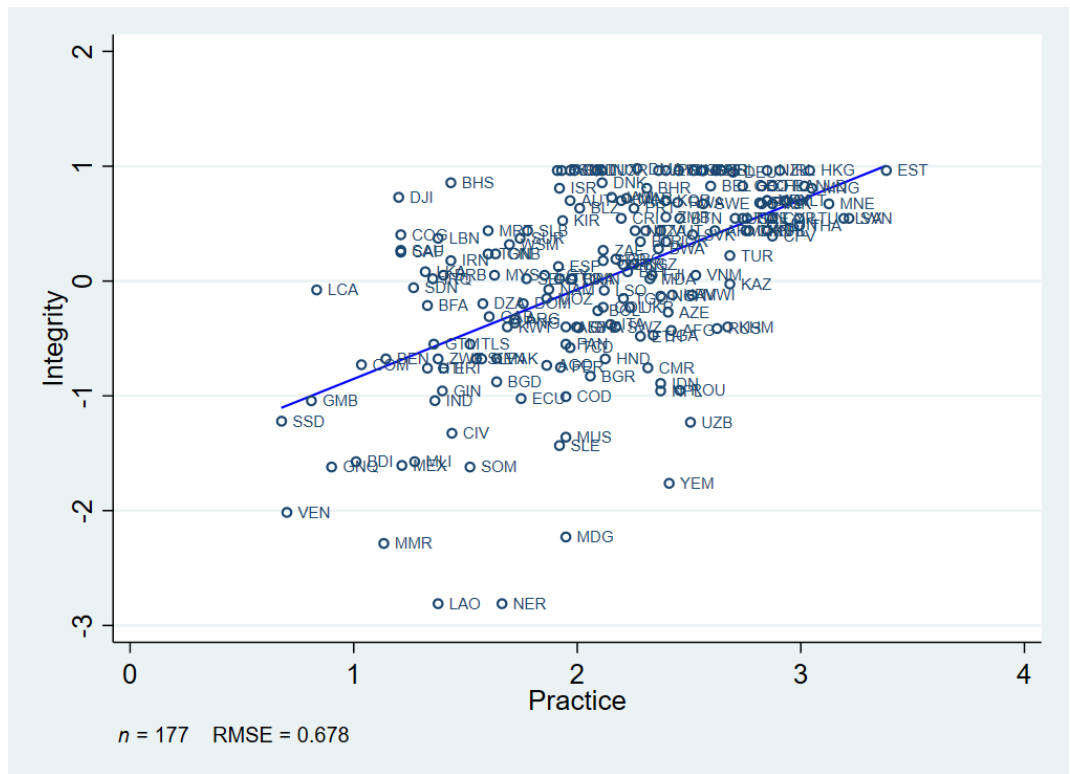
Figure 4. Quality and Regulatory Practice
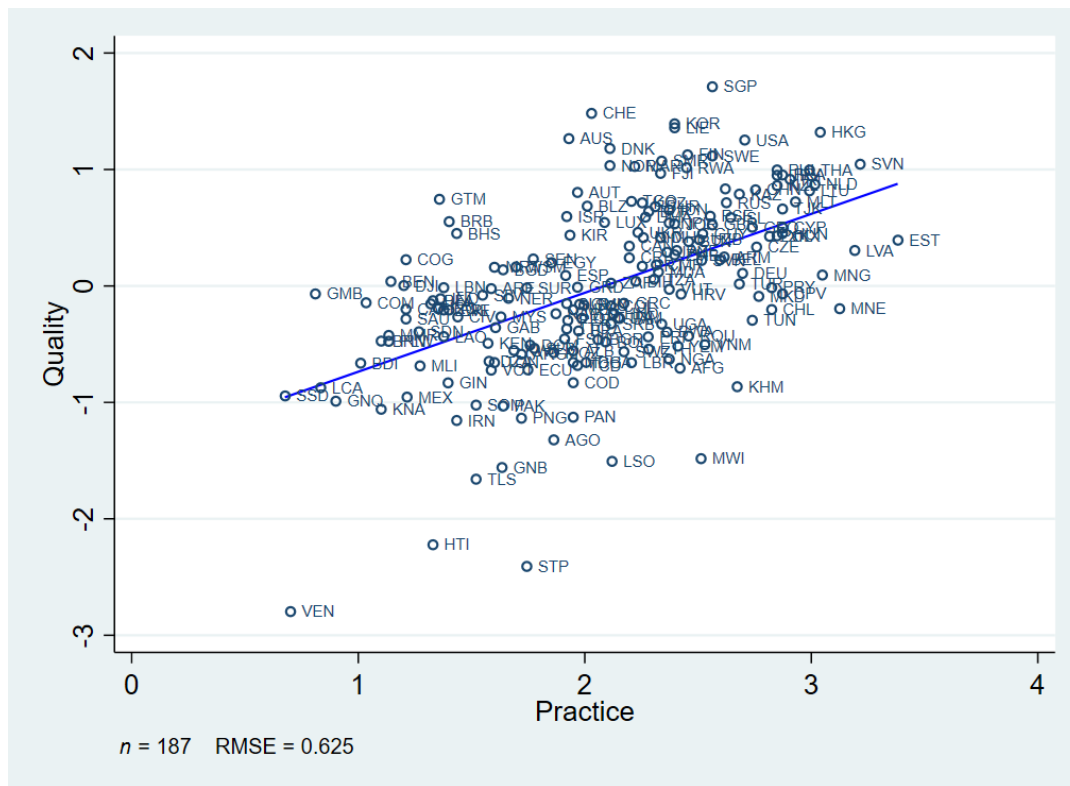
In contrast, Figures 5 and 6 show that the laws controlling government procurement are not correlated with either Integrity or Quality.

Figure 5. Integrity and Procurement Laws
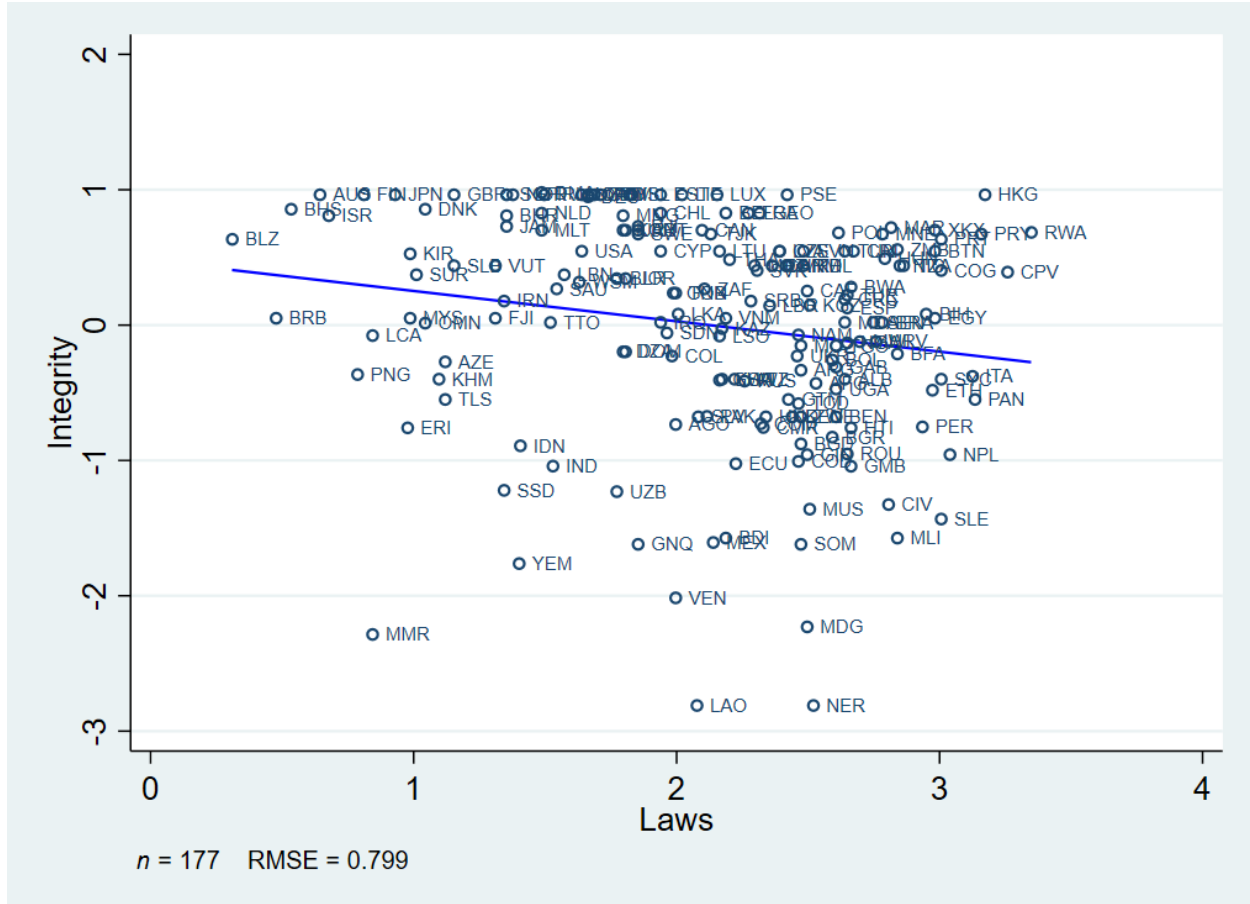
Figure 6. Quality and Procurement Laws
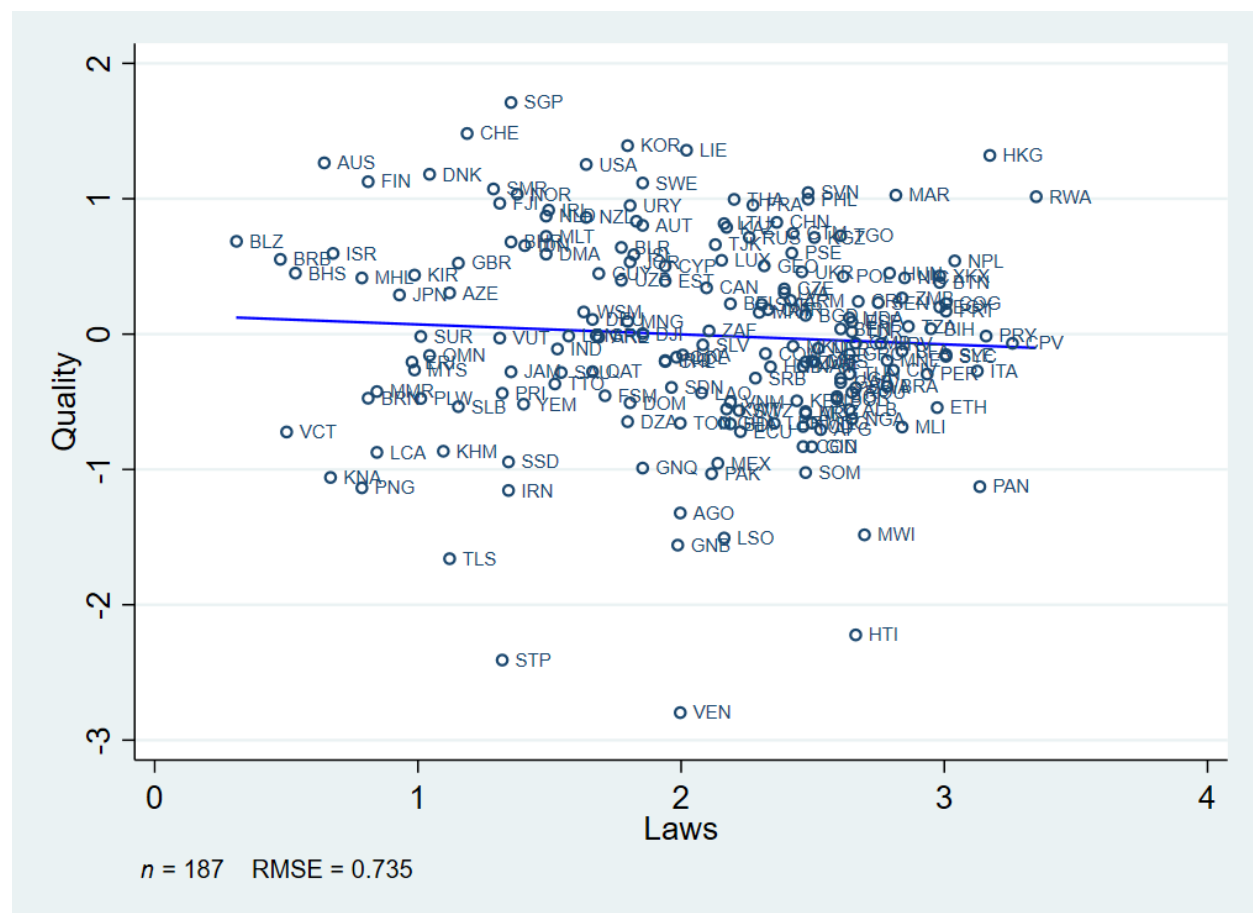
We can consider two alternative explanations of these correlations. The first is that laws do not matter at all, and what matters is PSC, which is reflected in the practice variable. According to this view, laws are passed to conform with international norms or treaty obligations but are then ignored completely in practice in low PSC countries. Laws may also not matter in high PSC countries if their practice goes far beyond the minimal standards enacted into law. This explanation does not account for the positive correlation (0.185) between laws and practice in the data. Moreover, the correlations between laws and practice are particularly strong in some subindices. For example, the correlation coefficient between transparency laws and transparency practice is 0.72, and that between competition laws and competition practice is 0.28.

The second explanation is that laws do matter, but that their effect is mediated by the PSC. Public officials may use their discretion for ulterior motives in low PSC countries, but to improve outcomes in high PSC ones. Practice will then be weaker than laws in low PSC countries as

bureaucrats fail to follow the laws, but stricter than laws in high PSC ones as bureaucrats exceed the minimal rules in pursuing good outcomes. This explanation is broadly consistent with earlier research on the benefits of discretion in the public sector (Rasul et al. 2019; Best et al. 2019; Baltrunaite et al. 2020; Bandiera et al. 2020; Decarolis et al. 2020a). It is also consistent with all the empirical findings we have reported so far. And it has two additional implications that distinguish it from the first explanation and that we can check in our data.

Figures 7 and 8 look at the critical implication that the laws that we measure display different correlations with outcomes depending on the PSC. We use education as our proxy for PSC. Education is strongly correlated with both income and other measures of PSC, and is a bit more removed from procurement than the direct measures of administrative effectiveness. Our results do not change much if we use more direct measures of PSC.

Figure 7 shows that Quality rises with stricter laws in countries with below median educational attainment, but, if anything, falls with stricter laws in countries with above median education. These findings are hard to reconcile with the hypothesis that laws just do not matter. Figure 8 shows that Integrity weakly improves with stricter laws in countries with lower educational attainment but decreases with laws in countries with higher attainment. The coefficient on laws predicting Integrity is not different between high and low human capital samples, with a t-statistics of -1.82; the coefficient on laws predicting Quality is not different between the two samples either, with a t-statistic of -1.44. Appendix Table B1 confirms these findings in a regression format.

Figure 7. Quality and Law, by Educational Attainment

n = 85   RMSE = 0.625

n = 85   RMSE = 0.625

Figure 8. Integrity and Law, by Educational Attainment

n = 83   RMSE = 0.820

n = 80   RMSE = 0.588

A further prediction of the second explanation is that practice is weaker than laws in low PSC countries, but more restrictive in high PSC ones. The difficulty with making this comparison is that while the measures of laws and practice are not identical in the data, in most cases, the match is quite close. The law question "By law, do tender documents and technical specifications need to be made publicly available by the PE?" is matched with the practice question "In practice, are

tender documents and technical specifications made publicly available by the PE?" In other cases, the match is imperfect. The question "Does the law regulate the scope, limits, and disclosure of contract renegotiations?" is paired with "Does the PE avoid using the renegotiation process to increase the price or the scope of the project without another competitive process?"

While the levels of the laws and practice variables are generally comparable, the mismatch of some variables means that our results here are only suggestive. We can split the sample at the median education level and compare the mean levels of laws and practice across countries (Appendix Table B2). The laws index in low human capital countries is 2.21 and the practice index is 1.90. The difference is highly statistically significant, with a t-statistic of 3.73. In high human capital countries, the pattern is reversed so that the mean laws index is 1.98 and the mean practice index is 2.32. Again, the difference is statistically significant, with a t-statistic of -4.42. In our data, practice is stricter than laws in higher PSC countries, and the reverse is true in lower PSC ones.

We next turn to a model motivated by these stylized facts that tries to explain why laws predict practice and practice predict outcomes, why stricter laws do not predict better outcomes, and why the patterns look so different in high and low PSC countries.

IV. A Model of Procurement

We propose a model of procurement that illustrates the impact of regulating a government procuring entity (PE) on the procurement outcomes. Like our data, the model distinguishes laws governing procurement, which we treat as restrictions on PE's discretion, from procurement practice, which need not coincide with laws.

Our model follows the structure of the scenario used in the survey. The PE must build a fixed segment of a road. There are two potential bidders, who bid in a sealed-bid second price auction. They do not collude. The road quality is initially determined solely by the identity of the winning bidder, and there is no moral hazard. We endogenize quality later.

The road can be built either by an "insider" who has cost K_I and delivers quality Q_I, or an "outsider" with cost K_O and quality Q_O. The contractor is paid by the PE and consumer surplus is defined as quality minus payment. We assume that only the insider can bribe the PE; the outsider

is either bound by external rules or is not in a relationship of trust with the PE. We define the PE's objective as $\alpha(quality - payment) + bribes$ -- *bribe-related penalties*. Here *bribes* are side payments made by the insider to the PE. The parameter α captures the extent to which the PE internalizes social welfare, which in turn reflects the PSC of the country.

To model *bribe-related penalties*, we assume that, with probability μ, a bribe is discovered, and then a penalty of ϑ_{PE} times the bribe is imposed on PE and a penalty of ϑ_I times the bribe is imposed on the insider. The PE's expected gain from a bribe of size X is $X(1 - \mu\vartheta_{PE})$, while the insider's cost of paying a bribe of size X is $X(1 + \mu\vartheta_I)$. We assume that $1 > \mu\vartheta_{PE}$, and use the notation $B = X(1 - \mu\vartheta_{PE})$, so that B captures the expected benefit of the bribe to the PE (which we just refer to as the bribe). We also let θ denote $(1 + \mu\vartheta_I)/(1 - \mu\vartheta_{PE})$, so that θB represents the cost of the bribe to the contractor. The value of θ rises both with the probability that bribes are detected (μ), which should be higher in higher PSC countries, and with the severity of punishment (ϑ_{PE} and ϑ_I). An alternative interpretation of θ is that for a cost of θ-1 times the bribe, the bribe can be shrouded and made legally non-verifiable. The value of θ then again reflects the ability to detect and verify a bribe, which rises with PSC.

We first consider regulation of exclusion in the bidding process, a critical aspect of procurement regulation. We later examine regulation of transparency, i.e., whether the PE must inform the outsider about the auction. Transparency is different from exclusion in that in practice there can be either more or less transparency than is legally required.

While the PE must use a second price auction, we consider two alternative institutional arrangements for exclusion: regulation and discretion. We define regulation to mean that the PE is not allowed to exclude buyers from the auction. The PE is then unable to either exclude a low price bidder she knows to be low quality, or to make a side deal with the insider to exclude the outsider. With discretion, the PE may exclude either bidder because of allegedly low quality. Quality levels are known to both bidders and the PE, but are not legally verifiable. Consequently, discretion to exclude cannot be made contingent on bidder quality; nor can payment to the bidder be contingent on quality ex post.

The upside of discretion is that the PE may exclude a lower-quality bidder who would otherwise win the auction by bidding less. The downside is that the PE may choose to exclude an

outsider and make a corrupt deal with the insider. We analyze the relationship between regulations and PSC, which is captured by α.

Regulation in this model is meant to capture the legal rules described in section II, particularly the ease of exclusion. We assume that this rule binds, so the model cannot explain why in some countries exclusion is restricted by law but common in practice. The absence of regulation, or PE discretion, can lead to a divergence between rules and practice. Without regulation, the PE has the power to exclude low-quality bidders but can also use that power to exclude outsiders. When the PE chooses to exclude a higher-quality bidder, we can point to a divergence between rules and practice.

The model delivers a version of both Integrity and Quality. Corruption, which results from the PE making deals with the insider, is one component of the Integrity index. If the PE unduly favors the insider by excluding the outsider, then there is favoritism and absence of competition, which are the other two elements of Integrity. Integrity may be low even if the excluded outsider offers lower quality, because the benefits from including him may exceed the higher prices in a one-bidder auction. Quality is captured by final product quality and price, which in the data are measured as low quality and cost overruns. Low Quality manifests itself if the PE selects the insider with poor quality. Quality is equivalent to consumer welfare in the model, defined as quality minus price. All proofs appear in Appendix D.

We assume that there is a maximum possible payment for service C_{max}, and that $\min [Q_I, Q_O] > C_{max} > \max[K_I, K_O]$, so that it is always optimal to build and that both builders are willing to build for a fee of C_{max}. Higher PSC could also lead to a lower value of C_{max}, since more effective government bureaucrats should be able to more accurately determine a reasonable upper bound for these private costs. All parameters are common knowledge.

In a regulated second price auction with no exclusion, both bidders accurately report their costs and neither has a reason to bribe the PE. They do not benefit from knowing the bid of the other firm, and the PE cannot exclude either bidder. Since rules are obeyed, this model automatically delivers the result that regulation reduces corruption. The regulated second price auction does not, however, maximize consumer surplus, both because it ignores quality and because the winning bidder usually earns profits.

When the PE has discretion, the insider can bribe the PE either to keep him in the auction even though he delivers low quality, or to exclude the outsider. In negotiations over bribes, we assume that the PE has bargaining power β, so the Nash bargain maximizes: $(U_{BARGAIN} - U_{NO})^\beta (I_{BARGAIN} - I_{NO})^{1-\beta}$, where $U_{BARGAIN}$ and $I_{BARGAIN}$ are the PE's welfare and the insider's profits in a bargain, and U_{NO} and I_{NO} are the PE's welfare and the insider's profits if no bargain is reached. The bargain may involve a bribe from the insider to the PE, but not from the PE to the insider. Recall that we have assumed that a bribe of B costs the insider θB, with $\theta > 1$. The parameter θ captures the waste involved in non-cash bribes, such as quasi-legal gifts, campaign contributions, or favors. Higher PSC entails a higher value of both θ and α. Empirically, we identify higher values of national human capital with higher values of α and θ.

At the negotiation stage, the PE can commit to exclude the outsider or include the insider in exchange for a bribe, but cannot threaten to take any action that is not in her ex-post interest. If the bargaining fails, the PE optimizes her own welfare, which, with no bribe, coincides with social welfare, defined as consumer surplus. The quality gap between outsiders and insiders is denoted $\Delta = Q_O - Q_I$. We then have:

Proposition 1: If $K_0 < K_I$, then discretion (i) raises welfare by excluding the low-quality outsider if $\Delta < -(C_{max} - K_I)$, (ii) reduces welfare by excluding the outsider if $-(C_{max} - K_I) < \Delta < \left(\frac{1}{\alpha\theta} - 1\right)(C_{max} - K_I)$, and (iii) has no impact on welfare if $\Delta > \left(\frac{1}{\alpha\theta} - 1\right)(C_{max} - K_I)$.

If $K_0 > K_I$, then discretion (i) raises welfare by excluding the low-quality insider if $\Delta > Max\left[C_{max} - K_O + \frac{K_O - K_I}{\alpha\theta}, \frac{C_{max} - K_I}{\alpha\theta}\right]$, (ii) reduces welfare by excluding the outsider if $\alpha\theta < 1$ and $\Delta < \frac{C_{max} - K_I}{\alpha\theta}$, and (iii) has no impact on welfare if $\alpha\theta > 1$ and $\Delta < C_{max} - K_O + \frac{K_O - K_I}{\alpha\theta}$.

Figures 9 and 10 illustrate the different cases in Proposition 1. Figure 9 shows the case in which the outsider has lower costs and would win the auction if not excluded. The horizontal axis, $\alpha\theta$, reflects PSC. The vertical axis plots Δ, the quality advantage of the outsider.

Figure 9: Outsider is the lower-cost bidder
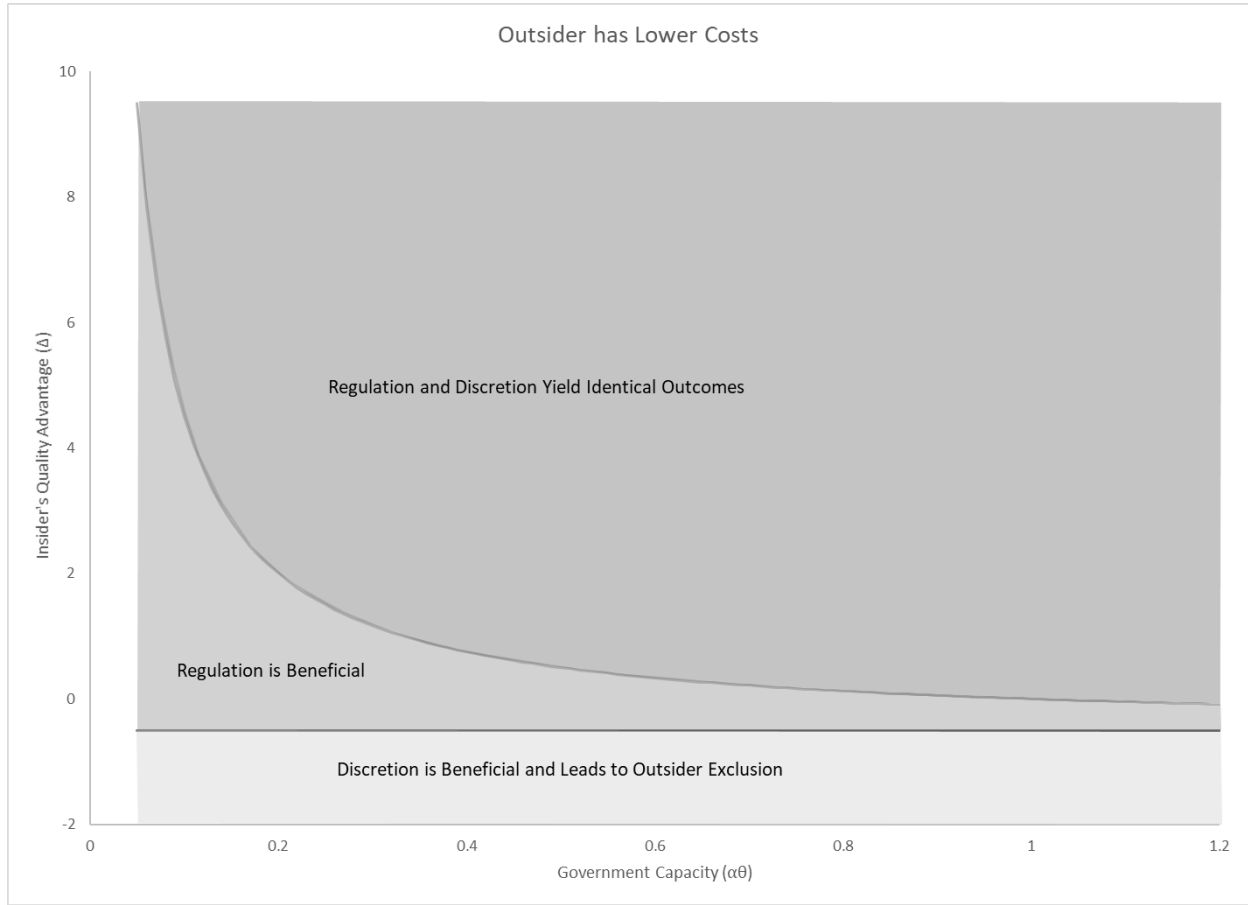
In the top region, where the quality advantage of the outsider is high, discretion delivers the same welfare as regulation. In this region, the PE always includes a high-quality outsider in the auction, even though the insider offers bribes to exclude him. The region becomes smaller when $\alpha\theta$ is low, and it disappears entirely when $\alpha\theta$ equals zero.

In the middle region, discretion leads the PE to exclude the outsider, which is a bad outcome. The price always rises. Quality also declines if $\Delta > 0$. In this region, if $\alpha\theta < 1$ and $\Delta > 0$, discretion creates a divergence between law and practice: the PE is meant to exclude low-quality bidders, but in practice excludes the higher-quality outsider in exchange for a bribe. If $\alpha\theta > 1$, then the PE excludes only the outsider with lower quality than the insider, so law and practice are aligned. Yet that exclusion may still be socially suboptimal if $\Delta > -(C_{max} - K_I)$, because the gain in quality does not offset the higher price that must be paid in a less competitive auction.

In the bottom region, where $\Delta < -(C_{max} - K_I)$, discretion also leads the PE to exclude the outsider, but the outsider's quality is so low that this outcome is socially optimal. Practice aligns with laws. Moreover, there are no bribes because the PE cannot commit to allow the outsider to remain in the auction, and therefore cannot extract any rents. If we had a distribution of values of Δ, then at low levels of $\alpha\theta$ efficient exclusion would be rare relative to the inefficient exclusion of higher-quality outsiders. For higher levels of $\alpha\theta$, efficient exclusion becomes the norm so that practice and laws are more aligned.

Figure 10 shows the case where the insider is the lower-cost bidder ($K_I < K_O$).

Figure 10: Insider is the lower-cost bidder
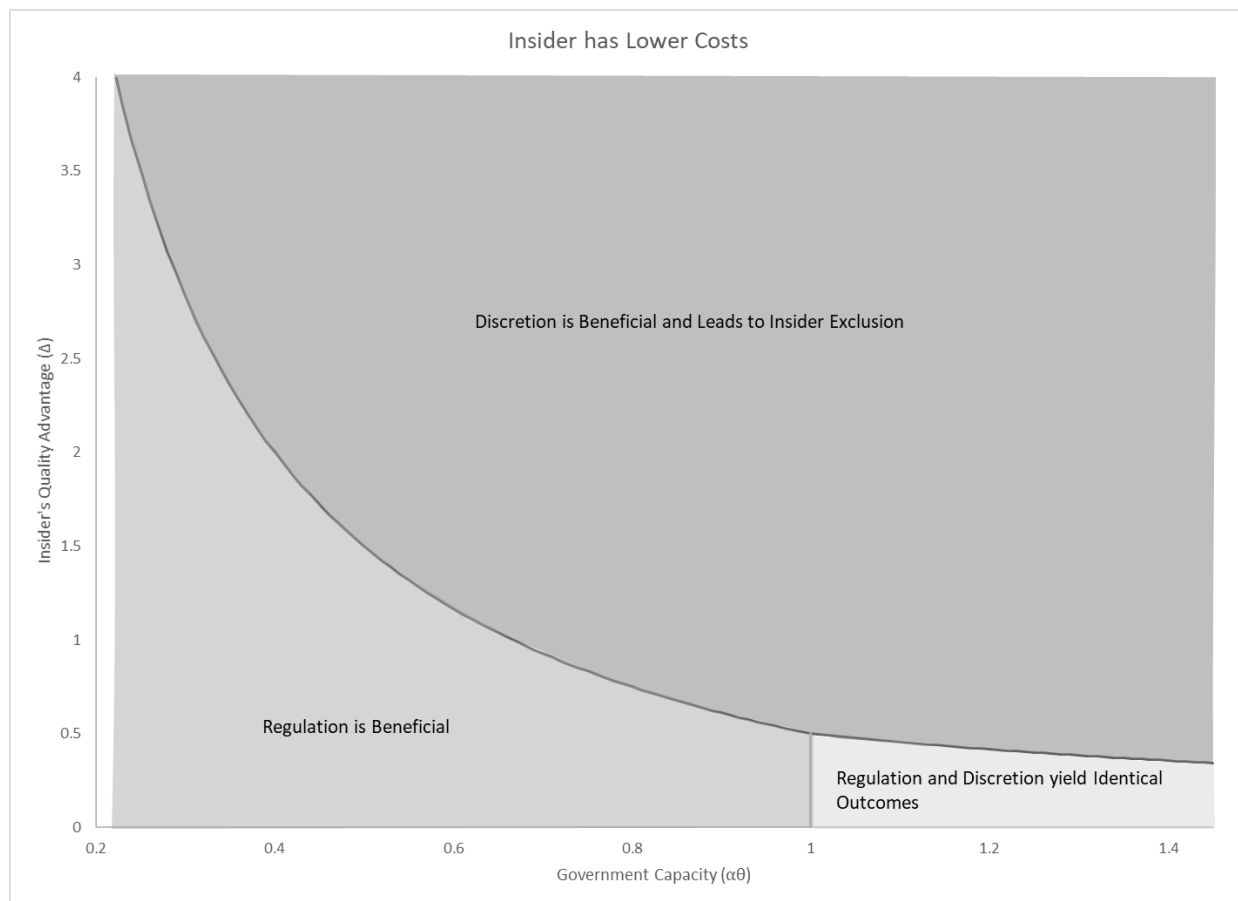
In this case, there are also three regions. When Δ is above the downward sloping curve, discretion leads to better outcomes because the low-quality insider is excluded from the auction. In this region, there are no bribes and laws and practice are aligned. Once again, as $\alpha\theta$ falls, this region becomes smaller and as $\alpha\theta$ goes to zero, it disappears.

When $\alpha\theta < 1$ and Δ is below the downward sloping curve, discretion leads to bad outcomes because the outsider is excluded. This region features the mismatch between laws and practice that the model predicts would appear in low PSC regimes. The PE is supposed to exclude low-quality bidders, but instead excludes high-quality outsiders in exchange for bribes. In this region, bribes do not change the identity of the winner relative to the regulated second price auction—the insider wins in either case—but they raise the price. The PE uses discretion to favor the insider and creates a noncompetitive auction, which we measure as inferior process. Quality and consumer welfare also decline because discretion raises the price for the same road.

When $\alpha\theta > 1$ and Δ is below the downward sloping curve, discretion is irrelevant. An accountable PE does not exclude the outsider when his quality advantage is modest, and so the regulated second price auction is replicated even with discretion.[3] With high enough PSC, practice and laws are aligned, since discretion is used only to exclude the low-quality insider, not the outsider in order to increase insider profits and reduce PE costs. If higher PSC also means a lower value of C_{max}, discretion is also more attractive.[4]

Regulation with Endogenous Quality

The case for discretion, as opposed to regulation, becomes stronger when firms know the rules and can respond by changing quality or cost or both. Discretion enables PEs to guard against opportunism because regulation makes them a fixed target for optimizing bidders.[5] We endogenize quality by assuming that the insider, but not the outsider, can take an action that reduces both costs and quality (e.g., by using inferior materials), as in Hart et al. (1997). This action is taken before any bidding or negotiation and requires an effort of ε, which is arbitrarily small. This effort cost is used in the model only to break ties, and is subsequently treated as a minute fixed cost. We assume

---

[3] Discretion produces the same consumer welfare in this region, but for a small parameter range it transfers wealth from the insider to the PE. The insider bribes the PE to keep him in the auction, despite low quality. In this case laws and practice diverge slightly, but quality is not worse relative to the regulated outcome.

[4] Another possibility is that at higher levels of PSC the PE has better information about the quality of the bidders. Since the upside of discretion is the ability to exclude low quality bidders, this information also favors discretion.

[5] This is very closely related to the idea of judicial discretion and common law, where judges are often allowed to use broad principles such as fiduciary duty to adjudicate disputes. In civil law judges rely on more precise legal rules, which opens opportunities for manipulation.

that the outsider is a large global firm, that cannot easily change its production methods for this particular setting. The insider is a smaller, nimbler local firm.

The outsider's quality and costs remain at Q_O and K_O. If the insider does not invest ε, we assume his quality is also Q_O and his costs are $K_O + A$. If the insider invests ε, his quality falls to $Q_O - \Delta$ and costs fall to $K_O - A$. We assume that $\Delta > C_{max} - K_O + A$, so it is optimal to exclude the insider who has cut costs and quality from the auction. In a second price auction, quality choice generates a race to the bottom, since the insider cuts costs to win the auction. Consumer welfare then equals $Q_O - \Delta - K_O$. Proposition 2 details outcomes when the PE has discretion and can reject a bidder with low quality.

Proposition 2: If the PE has discretion, then (i) if $\alpha\theta > 1$, the insider does not cut quality, loses the auction, and consumer welfare is $Q_O - K_O - A$; (ii) if $1 > \alpha\theta > \frac{C_{max} - K_O + A}{\Delta}$, the insider does not cut quality, the outsider is excluded, the insider wins the auction, and consumer welfare is $Q_O - C_{max}$; and (iii) if $\alpha\theta < \frac{C_{max} - K_O + A}{\Delta}$, the insider cuts quality, the outsider is excluded, the insider wins the auction, and consumer welfare is $Q_O - \Delta - C_{max}$.

The gains from discretion are highest when $\alpha\theta > 1$ because, in that case, the threat of exclusion stops the insider from cutting quality. The auction remains competitive and delivers a high-quality product. When $1 > \alpha\theta > \frac{C_{max} - K_O + A}{\Delta}$, the insider still does not cut quality, but the outsider is excluded from the auction. Discretion leads to higher quality but also higher prices. Because $\Delta > C_{max} - K_O + A$, the gain in quality is higher than the loss in price. In this region, the PE cares enough about social welfare that bargaining induces the insider to internalize the social welfare losses that come from cutting quality.

If $\alpha\theta < \frac{C_{max} - K_O + A}{\Delta}$, discretion leads to a corrupt bargain between the insider and the PE. The PE cares too little about social welfare to forgo bribes to get higher quality, so the insider cuts quality. The quality delivered is the same as in the regulated second price auction, but discretion enables the PE to cut the outsider from the bidding and push the price up. Discretion raises consumer welfare when PSC is high, but reduces it when PSC is low.

Laws, Practice, and Transparency

In the preceding model, divergence between laws and practice occurred when the PE was allowed to exclude a bidder, allegedly for low quality, but instead excluded high-quality bidders in exchange for bribes. When the law prevents any exclusion, the PE is bound to follow that law. The PE could then have worse but not better practice than regulated by the law. In a different area of regulation, such as transparency, practice can easily exceed legal mandates. The law may not require transparency, but the PE may still choose it. In our data, many countries, such as Egypt and Benin, have transparency practice weaker than laws. Other countries, such as the Netherlands, Lithuania, and the Czech Republic, have transparency practice stronger than what laws require. By allowing the PE to make a transparency choice, we allow both positive and negative divergence between law and practice.

We now assume that $Q_O = Q_I$, so there is no legitimate case for exclusion, and that $K_O < K_I$, so the insider loses the auction if the outsider bids. Moreover, we assume that the outsider cannot be excluded, but cannot bid when he does not know about the auction. We consider two institutional regimes: Transparency regulation means that the procuring entity is required to notify both bidders about the auction. Transparency discretion means that the PE can choose whether to notify the outsider.

We formalize transparency as the probability, denoted by π, that the outsider learns of the auction. The value of π is set by the PE and can be either $\pi_L < 1$ or 1. Absent a transparency law, the PE can set π to either π_L (which can be zero) or 1 at no cost. If transparency is regulated, the PE can either set $\pi = 1$ or pay a cost $\alpha z > 1$ to set $\pi = \pi_L$. The cost αz captures the hassle of deviating from legal norms and the risk of detection and penalty. This cost scales up with α so that cheating is costlier under more accountable governments. The PE negotiates with the insider before choosing π, and the two actors simultaneously agree on a bribe level (b) and a level of transparency (π). The PE can make a binding commitment to a level of transparency, or more accurately non-transparency. Both the insider and the PE are risk neutral. Proposition 3 describes the interplay between transparency laws and practice.

Proposition 3: If transparency is not regulated, the PE sets $\pi = 1$ if $\alpha\theta > 1$ and sets $\pi = \pi_L$ in exchange for a bribe if $\alpha\theta < 1$. If transparency is regulated, the PE sets $\pi = 1$ if $\alpha\theta > \frac{C_{max} - K_I}{C_{max} - K_I + \frac{z}{1-\pi_L}}$ and $\pi = \pi_L$ in exchange for a bribe if $\alpha\theta < \frac{C_{max} - K_I}{C_{max} - K_I + \frac{z}{1-\pi_L}}$.

Proposition 3 predicts that practice will be good even without laws when PSC is high. If $\alpha\theta > 1$, the PE ensures full transparency even without a transparency regulation. If PSC is low enough that $\theta < \frac{C_{max} - K_I}{C_{max} - K_I + \frac{z}{1-\pi_L}}$, then transparency is low even with transparency regulation, as is the Integrity of process, with or without laws. If $1 > \alpha\theta > \frac{C_{max} - K_I}{C_{max} - K_I + \frac{z}{1-\pi_L}}$, then laws bind, and the procurement process will have Integrity with a law, but not without one. In our model, transparency rules never do any harm, but in the world, there are many countries that have extensive regulation but impose few transparency requirements. If there is a cost of imposing these requirements, either on PE or the legislature, then the model predicts that they should not be adopted in high PSC countries. The proposition implies that practice is stricter than the law stipulates in high PSC countries, weaker than legal mandates in low PSC ones.

To the extent that there are pressures in an economy toward efficient institutions, our model implies that well governed countries should give their bureaucrats more discretion. Low PSC countries should regulate procurement more heavily. Yet, as Figure 1 illustrates, there is a great deal of variation in laws, holding per capita income constant. There are well governed countries, such as Canada, with high levels of procurement regulation, and countries with limited state capacity, like Eritrea, where procurement is lightly regulated. This mismatch between real-world institutions and the normative implications of our model might in some cases reflect poor measurement, but it seems at least as likely to reflect three factors missing from our model.

First, self-interested bureaucrats in low PSC countries may block reforms limiting their discretion. Second, the costs of adopting or changing legislation can mean that poor countries never adopt laws that would reduce corruption, and the richer countries never eliminate the rules that were optimal in earlier years when their PSC was lower. Third, in many cases, these rules are mandated by global treaties. Well governed European countries musts abide by the European Union's rules on procurement, even when discretion would be beneficial. Rules that are optimal for the treaty members collectively need not be optimal for every single country.

V. Empirical Predictions of the Model

The model makes several empirical predictions of the model for the relationships between laws, practice, Integrity, and Quality, which we compare to the cross-sectional evidence in Section III.

Prediction # 1: Practice are stricter than laws in high PSC countries and weaker than laws in low PSC countries.

The model predicts that when exclusion is not regulated, its practice is weaker than the laws in low PSC settings. When PSC ($\alpha\theta$) is sufficiently low, discretion to exclude bidders results in the exclusion of high-quality bidders, since the low-quality bidder pays a bribe. When exclusion is regulated, practice cannot be worse than laws because the laws are followed (by assumption). If we allowed the PE to pay a cost and avoid the regulation, as we do with transparency, we would also find that practice is weaker than laws when exclusion is regulated.

For regulation of transparency, high PSC leads to high transparency even without mandates. A high $\alpha\theta$ encourages the PE to notify the outsider even without the rules, because competition serves the PE's objectives of lower cost and higher quality. Breaking the transparency rule by the PE is more common when PSC is low. The model thus predicts that practice is stricter than laws when bureaucratic incentives are aligned with public welfare, but weaker than laws when these incentives are not aligned. With previously noted limitations of our data, this is what we have documented in Section III.

Prediction # 2: Higher PSC improves both Quality and Integrity, regardless of laws.

In the model, higher α and θ lead to better Integrity and Quality whenever the PE had any room to act. When the PE cannot exclude, these variables are irrelevant, since outcomes are everywhere the same. When the PE has discretionary power to exclude, good outcomes, such as the exclusion of low quality bidders, obtain when α and θ are high. Bad outcomes, such as the arbitrary exclusion of outsiders, obtain when α and θ are low.

In the model of transparency, because the law can be avoided at a cost, the role of PSC is particularly clear. When the PE has control over transparency, high levels of α and θ lead to

competitive auctions and lower prices, with or without a law. When α and θ are low, transparency is low, even with the law, so competition is lower, and prices are higher.

In the data, human capital (and other measures of PSC) is strongly correlated with the Integrity and Quality, holding procurement laws constant (Appendix Table B3). Controlling for the laws makes little difference, because as we have already seen in Figures 4a and 4b, laws are essentially uncorrelated with outcomes. PSC is consistently significant, with explanatory power of 30-40%. These results are of course compatible with many other models as well.

Prediction # 3: Procurement Laws deter corruption, especially in low PSC countries.

The model of regulation of exclusion predicts higher Integrity when exclusion is regulated (forbidden), because the PE has no discretion to exclude in exchange for a bribe. When the PE does have discretion, the insider can bribe her to exclude the outsider, reducing Integrity. The model thus predicts that control of exclusion deters corruption and improves Integrity. In contrast, the regulation of transparency does not guarantee a process with integrity. Since we allow the PE to flout the law at a cost, bribery still occurs in low PSC countries. In settings with modest PSC $(1 > \alpha\theta > \frac{C_{max} - K_I}{C_{max} - K_{I+z}})$, regulation eliminates bribes and improves Integrity.

With both forms of regulation, Integrity is higher when PSC $(\alpha\theta)$ is sufficiently high. If corruption is costly, or if the PE is public-spirited enough, she does not take bribes even if she has full discretion. The model then predicts that regulation should have a stronger positive impact on the Integrity of the procurement process at low levels of PSC. Regulation of the public sector does not, however, increase corruption or reduce Integrity at any level of PSC, unlike in the case of regulation of the private sector.

The regulation of business can cause corruption, either because businesses pay bribes to capture their regulators (Stigler 1971) or because government officials introduce regulations to extract bribes (Djankov et al. 2003). Regulating public officials can reduce bribes, by constraining their discretion. Regulation of private activity typically increases the discretion of public officials because they can choose whether or not to enforce the regulation.

In the data, when we control for a country's education, laws have a significant negative effect on corruption (Appendix Table C5), but we cannot address the endogeneity of these laws. This

measured effect is stronger in less educated countries, consistent with the model. Laws are more strongly associated with less corruption in countries with lower levels of human capital and PSC.

Prediction #4: Laws improve Quality and Integrity in low PSC countries and adversely affect them in high PSC ones.

In Section III, we showed that stricter laws correlate with better practice, better practice correlates with higher Integrity and Quality, but laws do not correlate positively with better outcomes. In the exclusion model, regulation is beneficial when α and θ are low because discretion leads to corruption. Regulation is harmful when α and θ are high because discretion enables the elimination of low-quality bidders. We see this prediction as the most important result of the model, and one documented in Figures 7 and 8.

Appendix Table B4 shows that the interactions between the law index and education are negative and statistically significant with either Integrity or Quality as the dependent variables. In Appendix Table C5, we show similar results with interactions between country-level education and the laws index, with subcomponents of Integrity and Quality. The interaction between law and education is significant for five out of the seven subcomponents of Integrity and Quality (collusion, favoritism, time to build, cost overruns and product quality). The interaction is insignificant with the absence of competition and bribes as dependent variable.

VI. Conclusion

Most countries regulate their bureaucracies in addition to regulating their private sectors. We investigate such regulation in the case of public procurement using the hypothetical study of a road resurfacing contract in 187 countries. We distinguish between regulatory rules and regulatory practice, and measure them in terms of how much discretion they allow procuring entities in selecting and managing contractors. We then evaluate the relationship between the two as well as their effect on procurement outcomes, namely the Integrity of the procurement process, and the Quality of the procurement product.

A look at the evidence shows tremendous dispersion on how heavily countries regulate the procurement process in law, with poorer countries generally having more extensive regulation. We find that procurement laws are highly, though not perfectly, correlated with procurement

practice. However, we also find some puzzling evidence. Although better procurement practice is highly correlated with procurement outcomes, stricter procurement laws generally do not predict better outcomes. A closer look shows that heavier regulation of procurement is associated with better outcomes in countries with lower-quality public sectors, and with worse outcomes in countries with higher-quality ones. The evidence supports recent findings from better-identified but more specific settings that point to the benefits of bureaucratic discretion (Coviello, Guglielmo, and Spagnolo 2018; Bandiera et al. 2020).

We present a new theoretical framework to explain this finding. The theory describes a procurement auction in which the organizers may take bribes in exchange for favoring connected bidders. The model allows us to discuss a variety of regulations of the procurement process, but also delivers a basic prediction: Procurement regulation is more socially valuable when bureaucrats (e.g., procuring entities) are less motivated by social welfare. Properly motivated bureaucrats require fewer rules.

There is a broader point as well. In many settings, economists and legal scholars see laws and their enforcement as complements—laws are more effective in countries with better judiciaries, bureaucracies, and the like. Here we find the opposite: laws and enforcement capabilities are substitutes. As argued by Best, Hjort, and Szakonyi (2019), policy change can act as an effective substitute for low bureaucratic capacity. Countries with weak bureaucracies need strict laws to regulate them; countries with strong bureaucracies can lay off a little. This message has application to the design of institutions, particularly the regulation of government.

References

Angrist, Noam, Simeon Djankov, Pinelopi K. Goldberg, and Harry A. Patrinos. 2021. Measuring human capital using global learning data. *Nature* 592: 403-408.

Baltrunaite, Audinga, Cristina Giorgiantonio, Sauro Mocetti, and Tommaso Orlando. 2020. Discretion and Supplier Selection in Public Procurement. *Journal of Law, Economics, and Organization*. https://doi.org/10.1093/jleo/ewaa009.

Bandiera, Oriana, Andrea Prat, and Tommaso Valletti. 2009. Active and Passive Waste in Government Spending: Evidence from a Policy Experiment. *American Economic Review* 99, no. 4: 1278–308.

Bandiera, Oriana, Michael Carlos Best, Adnan Qadir Khan, and Andrea Prat. 2020. The Allocation of Authority in Organizations: A Field Experiment with Bureaucrats. London School of Economics, mimeo.

Banerjee, Abhijit. 1997. A Theory of Misgovernance, *The Quarterly Journal of Economics* 112, no 4: 1289–1332.

Banerjee, Abhijit, Rema Hanna, and Sendhil Mullainathan. 2012. Corruption. In: *Handbook of Organizational Economics*, ed. Robert Gibbons, John Roberts. Princeton University Press.

Banfield, Edward. 1975. Corruption as a Feature of Governmental Organization. *Journal of Law and Economics* 18, no. 3: 587–605.

Baranek, Bruno, and Vitezslav Titl. 2020. The Cost of Favoritism in Public Procurement. Princeton University, Princeton, New Jersey, mimeo.

Barro, Robert J. 1999. Determinants of Democracy. *Journal of Political Economy* 107, no. S6: 158–83.

Bertrand, Marianne, Simeon Djankov, Rema Hanna, and Sendhil Mullainathan. 2007. Obtaining a Driver's License in India: An Experimental Approach to Studying Corruption. *Quarterly Journal of Economics* 122, no. 4: 1639–76.

Best, Michael Carlos, Jonas Hjort, and David Szakonyi. 2019. Individuals and Organizations as Sources of State Effectiveness. NBER Working Paper No. 23350. Cambridge, MA: National Bureau of Economic Research.

Bosio, Erica, Jean Arlet, Antoni Albert Nogues Comas, and Nicole Anouk Leger. 2018. Road Costs Knowledge System (ROCKS) – Update. Washington: World Bank. Database available at: https://www.doingbusiness.org/content/dam/doingBusiness/media/Special-Reports/roadcosts-knowledge-system-Updated.pdf

Botero, Juan, Simeon Djankov, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2004. The Regulation of Labor. *Quarterly Journal of Economics* 119, no. 4: 1339–82.

Botero, Juan, Alejandro Ponce, and Andrei Shleifer. 2013. Education, Complaints, and Accountability. *Journal of Law and Economics* 56, no. 4: 959–96.

Burgess, Robin, Remi Jedwab, Edward Miguel, Ameet Morjaria, and Gerard Padró i Miquel. 2015. The Value of Democracy: Evidence from Road Building in Kenya. *American Economic Review* 105, no. 6: 1817–51.

Campos, Nicolas, Eduardo Engel, Ronald D. Fischer, and Alexander Galetovic. 2019. Renegotiations and Corruption in Infrastructure: The Odebrecht Case. Available at http://dx.doi.org/10.2139/ssrn.3447631, Accessed July 1, 2020.

Center for Systemic Peace. 2019. *Polity IV Project: Political Regime Characteristics and Transitions, 1800-2013*. Vienna, VA.

Collier, Paul, and Martina Kirchberger. 2016. The Cost of Road Infrastructure in Low- and Middle-Income Countries. *World Bank Economic Review* 30, no. 3: 522–48.

Colonnelli, Emanuele, and Mounu Prem. 2020. Corruption and Firms. Available at http://dx.doi.org/10.2139/ssrn.2931602, Accessed July 1, 2020.

Conley, Timothy, and Francesco Decarolis. 2016. Detecting Bidders Groups in Collusive Auctions. *American Economic Journal: Microeconomics* 8, no. 2: 1–38.

Coviello, Decio, and Stefano Gagliarducci. 2014. Publicity Requirements in Public Procurement: Evidence from a Regression Discontinuity Design. *Journal of Public Economics* 109: 76–100.

Coviello, Decio, and Stefano Gagliarducci. 2017. Tenure in Office and Public Procurement. *American Economic Journal: Economic Policy* 9, no. 3: 59–105.

Coviello, Decio, Andrea Guglielmo, and Giancarlo Spagnolo. 2018. The Effect of Discretion on Procurement Performance. *Management Science* 64, no. 2: 715–38.

Decarolis, Francesco. 2014. Awarding Price, Contract Performance, and Bids Screening: Evidence from Procurement Auctions. *American Economic Journal: Applied Economics* 6, no. 1: 108–32.

Decarolis, Francesco, and Giuliana Palumbo. 2015. Renegotiation of Public Contracts: An Empirical Analysis. *Economics Letters* 132, no. C: 77–81.

Decarolis, Francesco, Leonardo M. Giuffrida, Elisabetta Iossa, Vincenzo Mollisi, and Giancarlo Spagnolo. 2019. *Bureaucratic Competence and Procurement Outcomes*. NBER Working Paper No. 24201. Cambridge, MA: National Bureau of Economic Research.

Decarolis, Francesco, Giancarlo Spagnolo, and Riccardo Pacini. 2020a. *Past Performance and Procurement Outcomes*. NBER Working Paper No. 22814. Cambridge, MA: National Bureau of Economic Research.

Decarolis, Francesco, Ray Fisman, Paolo Pinotti, and Silvia Vannutelli. 2020b. Corruption in Procurement: New Facts from Italian Government Contracting. Mimeo.

Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2002. The Regulation of Entry. *Quarterly Journal of Economics* 117, no. 1: 1–37.

Djankov, Simeon, Edward Glaeser, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2003a. The New Comparative Economics. *Journal of Comparative Economics* 31, no. 4: 595–619.

Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2003b. Courts. *Quarterly Journal of Economics* 118, no. 2: 453–517.

Djankov, Simeon, Oliver Hart, Caralee McLiesh, and Andrei Shleifer. 2008a. Debt Enforcement around the World. *Journal of Political Economy* 116, no. 6: 1105–49.

Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2008b. The Law and Economics of Self-Dealing. *Journal of Financial Economics* 88, no. 3: 430–65.

Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2010. Disclosure by Politicians. *American Economic Journal: Applied Economics* 2, no. 2: 179–209.

Duflo, Esther, Michael Greenstone, Rohini Pande and Nicholas Ryan. 2018. The Value of Regulatory Discretion: Estimates from Environmental Inspections in India. *Econometrica* 86, no. 6: 2123-2160.

Duflo, Esther, Rema Hanna, and Stephen P. Ryan. 2012. Incentives Work: Getting Teachers to Come to School. *American Economic Review* 102, no. 4: 1241–78.

Faccio, Mara. 2006. Politically Connected Firms. *American Economic Review* 96, no. 1: 369–86.

Fazekas, Mihaly. 2021. GTI's Global Government Contracts database. Government Transparency Institute, Vienna. July. Available at: http://www.govtransparency.eu/gtis-globalgovernment-contracts-database/.

Fisman, Raymond. 2001. Estimating the Value of Political Connections. *American Economic Review* 91, no. 4: 1095–102.

Freedom House. 2020. *Freedom in the World 2020*. Washington.

Flyvbjerg, Bent, Mette K. Skamris Holm, and Søren L. Buhl. 2003. How Common and How Large Are Cost Overruns in Transport Infrastructure Projects? *Transport Reviews* 23, no. 1: 71–88.

Glaeser, Edward L., Giacomo A. M. Ponzetto, and Andrei Shleifer. 2007. Why Does Democracy Need Education? *Journal of Economic Growth* 12, no. 2: 77–99.

Hart, Oliver, and John Moore. 1988. Incomplete Contracts and Renegotiation. *Econometrica* 56, no. 4: 755–85.

Hart, Oliver, Andrei Shleifer, and Robert W. Vishny. 1997. The Proper Scope of Government: Theory and an Application to Prisons. *Quarterly Journal of Economics* 112, no. 4: 1127–61.

Kelman, Steven. 1990. *Procurement and Public Management: The Fear of Discretion and the Quality of Government Performance.* Washington: AEI Press.

La Porta, Rafael, Florencio Lopez-de-Silanes, and Andrei Shleifer. 1999. The Quality of Government. *Journal of Law, Economics, and Organization* 15, no. 1: 222–79.

Lichand, Guilherme, and Gustavo Fernandes. 2019. The Dark Side of the Contract: Do Government Audits Reduce Corruption in the Presence of Displacement by Vendors? University of Zurich, Switzerland, mimeo.

Milligan, Kevin, Enrico Moretti, and Philip Oreopoulus. 2004. Does Education Improve Citizenship? Evidence from the United States and the United Kingdom. *Journal of Public Economics* 88: 1667–95.

Mironov, Maxim, and Ekaterina Zhuravskaya. 2016. Corruption in Procurement and the Political Cycle in Tunneling: Evidence from Financial Transactions Data. *American Economic Journal: Economic Policy* 8, no. 2: 287–321.

Olken, Benjamin. 2007. Monitoring Corruption: Evidence from a Field Experiment in Indonesia. *Journal of Political Economy* 115, no. 2: 200–49.

Olken, Benjamin, Abhijit Banerjee, Rema Hanna, Jordan Kyle, and Sudarno Sumarto. 2018. Tangible Information and Citizen Empowerment: Identification Cards and Food Subsidy Programs in Indonesia. *Journal of Political Economy* 126, no. 2: 451–91.

Pande, Rohini. 2011. Can Informed Voters Enforce Better Governance? Experiments in Low-Income Democracies. *Annual Review of Economics* 3: 215–37.

Porter, Robert, and John Zona. 1993. Detection of Bid Rigging in Procurement Auctions. *Journal of Political Economy* 101, no. 3: 518–38.

Rasul, Imran, and Daniel Rogger. 2018. Management of Bureaucrats and Public Service Delivery: Evidence from the Nigerian Civil Service. *Economic Journal* 128, no. 608: 413–46.

Rasul, Imran, Daniel Rogger, and Martin J Williams. 2019. Management and Bureaucratic Effectiveness: Evidence from the Ghanaian Civil Service. *Mimeo: University College London.*

Sequeira, Sandra, and Simeon Djankov. 2014. Corruption and Firm Behavior: Evidence from African Ports. *Journal of International Economics* 94, no. 2: 277–94.

Shleifer, Andrei, and Robert Vishny. 1993. Corruption. *Quarterly Journal of Economics* 108: 599–617.

Spagnolo, Giancarlo. 2012. Reputation, Competition and Entry in Procurement. *International Journal of Industrial Organization* 30, no. 3: 291–96.

Stigler, George. 1971. The Theory of Economic Regulation. *Bell Journal of Economics and Management Science* 3: 3–18.

Svensson, Jacob. 2003. Who Must Pay Bribes and How Much? Evidence from a Cross Section of Firms. *Quarterly Journal of Economics* 118, no. 1: 207–30.

Szucs, Ferenc. 2017. Discretion and corruption in public procurement. University of California at Berkeley, job market paper.

WEF (World Economic Forum). 2019. *Global Competitiveness Report 2019: How to End a Lost Decade of Productivity Growth*. Geneva.

World Bank. 2020. *World Development Indicators.* Washington.

<div align="center">

Public Procurement in Law and Practice

Erica Bosio, Simeon Djankov, Edward Glaeser, Andrei Shleifer

Online Appendix

</div>

Appendix A: Description of Variables

The questionnaire used to collect the data had four parts, following the main chronological stages of the typical public procurement process: prebidding, bidding, execution, and payment. In each part, respondents were presented with four types of requests: (1) indicate which rules regulate each stage of public procurement; (2) outline the procedures that would be followed in the award and execution of a contract for the resurfacing of a flat two-lane road; (3) indicate how long each procedure would take; and (4) answer multiple-choice questions on the frequency of certain occurrences in public procurement, such as collusion or bribery.

The prebidding stage covers the PE's administrative process to identify its procurement needs and secure the related funds. Respondents were asked to indicate how the contract value is normally estimated and whether it is published in the tender documents. We also asked whether the PE needs to obtain all necessary funds before advertising the opportunity or can do so without having secured the budget.

The bidding stage concerns how the procurement method is chosen, how the information related to the tender is made publicly available, and how bids are collected from the private sector. The bid opening, evaluation, and contract signing phases depend on the criteria used to evaluate bids and award the contract. Respondents were asked which procurement method would most commonly be used for a routine contract for road resurfacing, and whether price would be the most common criterion for the award of such a contract. They also described how the process would evolve and the most common sources of delay.

The execution stage involves the procedures from the contractor's receipt of notice to proceed until completion of the work, including requirements on contract amendments. Respondents estimated how often, and by how long, completion of the contract is delayed by changes in terms resulting from contract renegotiations or additional work requests. They also indicated the laws

<div align="center">1</div>

that regulate subcontracting and the disclosure requirements on BidCo if it decides to subcontract part of the work.

Finally, the payment stage measures the laws and practices concerning the timeliness and frequency of payments. Respondents estimated how long it takes to collect payment from the procuring entity, as well as the frequency of inspections and how often disagreements on such inspections delay contract completion and payment.

The questionnaire was completed by lawyers with experience in administrative, procurement, and infrastructure law; construction companies specializing in the road sector; and government officials from the relevant procuring entities (for example, public works ministry, road authority, or procurement agency). Figure A1 shows the distribution of countries by the number of experts consulted by the team. An in-depth study of laws, regulations, and publicly available information on public procurement verifies this information. If answers by local experts differ, inquiries continue until the data are reconciled, including through country visits. The median is used to aggregate numeric answers.

Figure A1. Distribution of Countries by Number of Experts
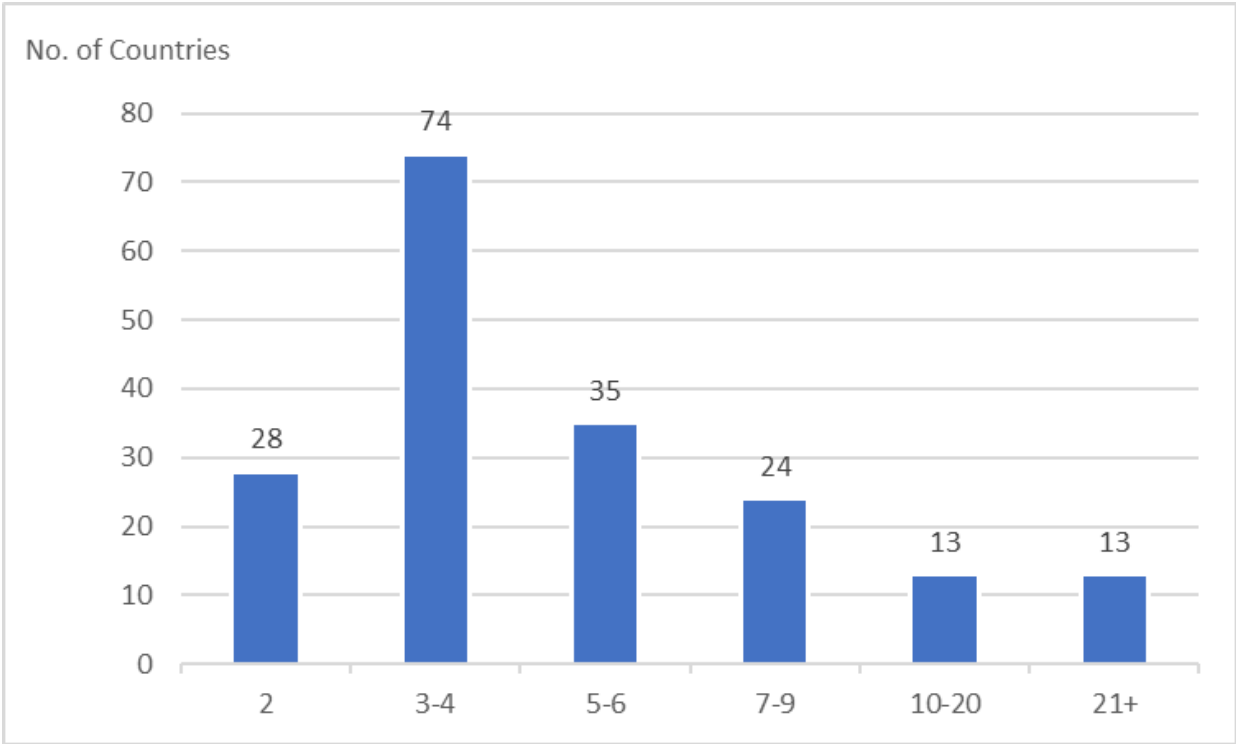
Case Study

The data is collected through a case study with a series of assumptions. The contract entails the resurfacing of 20 km of a two-lane flat road and the value of the contract is $2,500,000. Three exercises were conducted to determine the representativeness of the case study used to collect the data.

First, the team analyzed how legislators treat different size procurement projects. In particular, we examine over 1,600 pieces of legislation across 187 countries to determine whether the law stipulates particular thresholds by size for works (construction) contracts, and whether such thresholds call for different rules. This analysis suggests that the hypothetical case study facts are fully applicable for public works contracts in the range of $250,000 to $5,000,000, with no exceptions in the sample; and are applicable for all contract sizes in 123 sample countries. In 29 percent of the sample (54 out of 187 economies), no rules or simpler rules apply for small (below $250,000) contracts, an unlikely value for road resurfacing work.[1] In 8.5 percent of the sample (16 out of 187 economies) some stricter rules apply in the public procurement process for larger-size (above $5,000,000) contracts. In these 16 countries – Australia, Bulgaria, Cyprus, the Czech Republic, Finland, France, Germany, Iceland, Ireland, Italy, Luxemburg, Netherlands, Norway, Switzerland, the United Kingdom and the United States – the procurement process is usually more regulated for larger projects. Typical differences include timelines regulated by law (as opposed to left at the discretion of the PE in the tender documents), more stringent publication requirements and more frequent pre-qualification processes. Note that 6 countries have both higher and lower thresholds and are thus accounted for in both groups. As a robustness check, we replicated the analysis after removing these 16 countries, which all fall in the "More Educated" category. Figures A2 and A3 replicate Figures 7 and 8 in the main text. The relationship between law and outcomes remains insignificant in the smaller sample with these 16 countries excluded.

---

[1] The 54 countries are Algeria, Argentina, Benin, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Comoros, Congo Dem. Rep., Congo Rep., Côte d'Ivoire, Croatia, Cyprus, the Czech Republic, Djibouti, Dominica, Dominican Republic, Estonia, Fiji, Finland, Gabon, Grenada, Guatemala, Guinea, Guinea Bissau, Haiti, Hungary, Latvia, Mali, Mauritania, Mexico, Moldova, Montenegro, New Zealand, Niger, North Macedonia, Norway, Peru, Poland, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Togo, Tonga, Tunisia, Uganda, the United Kingdom, Vanuatu, and Zambia.

Figure A2. Quality of Product and Law in More Educated Countries

Figure A3. Integrity and Law in More Educated Countries
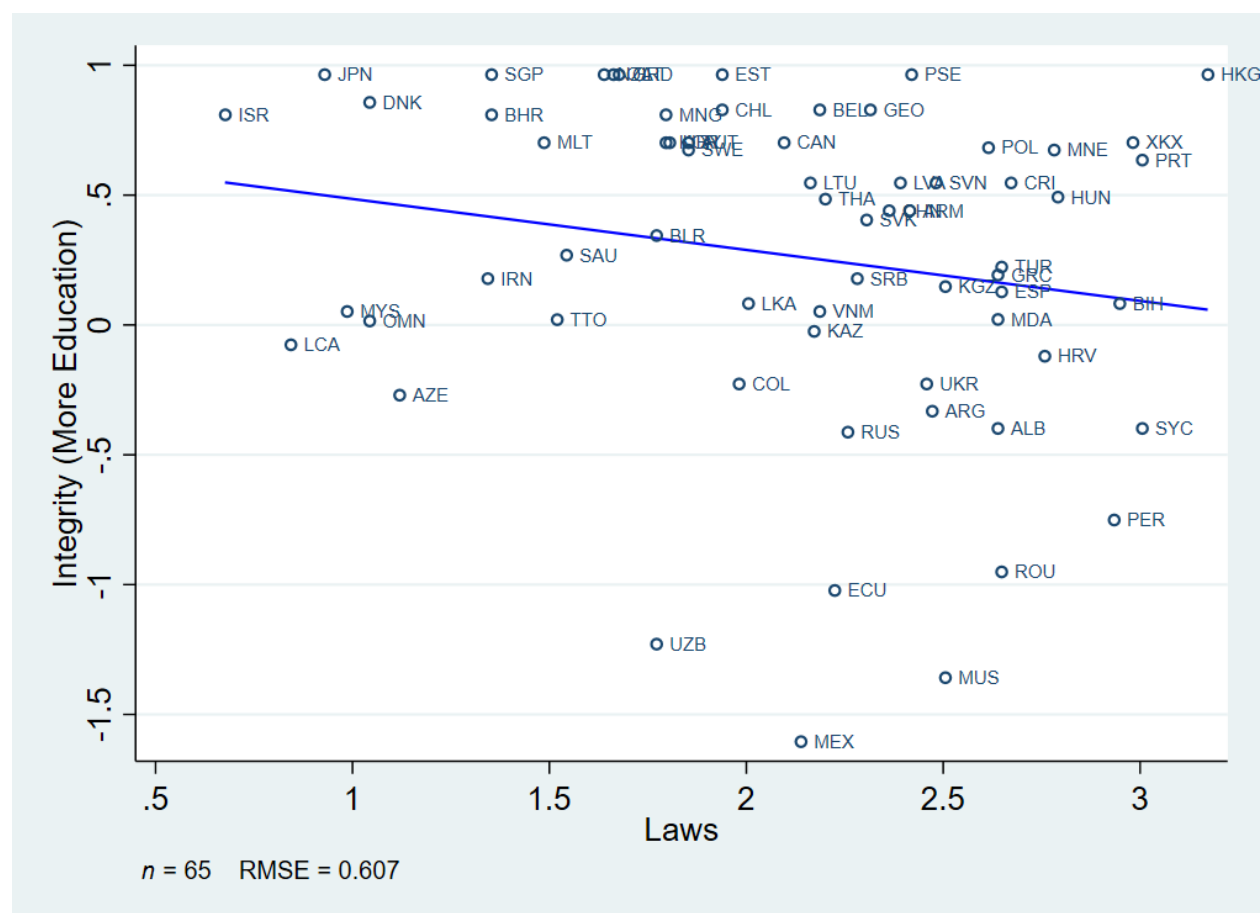
Second, we collect and analyze data on the actual size of procurement contracts in the latest available year with official national statistics. These statistics usually come from annual reports of the national procurement entity or the annual budget report of the Ministry of Finance. We are able to report data on 103 of 187 sample countries.[2] We have done extensive searches in the local languages in all other sample countries. There is information of the overall expenditure on public procurement in an additional 83 countries, but no data on the number of procured projects. The

---

[2] The 103 countries are Afghanistan, Albania, Angola, Argentina, Armenia, Australia, Austria, Bahrain, Bangladesh, Belarus, Belgium, Benin, Bosnia and Herzegovina, Brazil, Bulgaria, Burkina Faso, Burundi, Cameroon, Canada, Chad, Chile, Colombia, Congo, Dem. Rep., Congo, Rep., Costa Rica, Côte d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, El Salvador, Estonia, Fiji, Finland, France, Georgia, Germany, Greece, Guatemala, Guyana, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Kazakhstan, Kenya, Kosovo, Kyrgyz Republic, Latvia, Lebanon, Liberia, Lithuania, Luxembourg, Mali, Malta, Mexico, Moldova, Mongolia, Montenegro, Nepal, Netherlands, New Zealand, Nicaragua, Nigeria, North Macedonia, Norway, Oman, Pakistan, Panama, Philippines, Poland, Portugal, Romania, Saudi Arabia, Sierra Leone, Singapore, Slovak Republic, Slovenia, Spain, St. Vincent and the Grenadines, Sweden, Switzerland, Tanzania, Thailand, Togo, Uganda, Ukraine, the United Kingdom, the United States, Uruguay, Uzbekistan, Vietnam, Yemen, Rep., and Zambia.

data are for all public procurement and not only construction works. Few countries report data for goods, services and public works separately, and even then, some sectors fall between these categories. The average size of public procurement projects in our sample is USD659,806, with variation across income groups (Table A1). This is a smaller number than the hypothetical case study, likely because it includes all categories of procurement (goods, services and works). The procurement of goods and services often involves repeated small-value contracts, such as to purchase pencils or obtain cleaning services.

Table A1. Average Project Size by Region

Income Group	Obs.	Mean	Median	Std. Dev.	Min	Max
All income levels	103	659,806	203,407	1,309,126	2,202	8,626,597
High income	42	938,568	595,937	1,470,487	8,280	8,626,597
Low income	36	646,178	186,893	1,450,239	2,202	8,366,445
Middle income	25	211,113	43,421	420,210	5,005	1,914,488

Third, for a subset of 82 countries where data is available, we collect data on actual public works contracts involving road resurfacing. We show that the median value for a two-lane road resurfacing contract is USD4,698,659, with a wide distribution (Figure A4). Low-income countries typically display higher values (i.e. it is more expensive to resurface roads in poorer countries). The analysis shows that no country in this 82-country sample falls into the lower or upper limit of countries which by law have different rules than the ones coded in our cases study. In other words, the coded law applies in all cases.

Figure A4. Distribution by contract value, with country names

Contract value	Countries (bottom to top)
0-250K	Lao PDR
250K- 1M	Guinea, Peru, Nepal, South Sudan, Bangladesh
1M - 2M	Burkina Faso, Romania, New Zealand, Germany, India, Cambodia, Vietnam, Yemen, Rep., Bolivia, Sri Lanka, Morocco, Djibouti, Mexico, Mongolia, Niger
2M-3M	Papua New Guinea, Senegal, United States, Madagascar, Indonesia, Armenia, Macedonia, FYR, Mali, Brazil
3M-4M	China, Poland, Georgia, Albania, Congo, Dem. Rep., Nicaragua, Mozambique, Sudan, Iraq, Paraguay, Switzerland, Namibia, Australia, Cameroon, Yugoslavia, Austria, Canada
4M-5M	Angola, Tunisia, Estonia, Argentina, Kyrgyz Republic, Cabo Verde, Nigeria, Pakistan, South Africa, Burundi
5M-6M	Chad, Zambia, Philippines, Uganda
6M-8M	Swaziland, Benin, Uruguay, Malawi, Bulgaria, Cape Verde, Honduras
8M-10M	Sao Tome and Principe, Kazakhstan, Azerbaijan, Belize, Afghanistan, Samoa, Tanzania, Kenya
10M+	Lesotho, Haiti, Ghana, Ethiopia, Mauritius, Ukraine

The value of the contract was determined as the average between the size of public procurement projects and the median value for a two-lane resurfacing contract. The analysis presented above shows that the same rules would apply to contracts between $250,000 to $5,000,000 in the majority of countries.

Legal Framework

For all questions discussed below, the term "legal framework" refers to the body of instruments (laws, acts, regulations, etc.) that regulate the entire procurement process (from needs assessment to post-tendering). We code as "procurement laws" all legal instruments that are procurement-specific and mandatory. Guidelines are not included if they are self-imposed by the procuring entity or are for "recommended" use. Standard bidding documents and general contract terms are included whenever their use by the procuring entity is mandatory or when the procuring entity would have to justify a departure from their application. Customizable contract terms and non-binding instruments are not considered, as they can be modified at will by the procuring entity.

The analysis of the public procurement legal framework in 187 economies shows that 117 countries have standard documents or contract terms that are of mandatory use and were thus coded as "laws" for the purposes of our paper. Fifty-three countries have no such documents, and the

remaining 17 countries have standard documents or contract terms that are not of mandatory application. For these 17 countries, we reviewed the non-binding documents and re-coded the laws assuming that the procuring entity would apply them in their entirety. We find that non-binding documents have no impact on the coding of Afghanistan, Iceland, Lithuania and Poland; minor impact (2 points or less) on the coding of Armenia, Azerbaijan, Belarus, New Zealand, Singapore, Spain, Taiwan, and the United States; and significant impact (3+ points) on the coding of Australia. We were not able to obtain documents for Bosnia and Herzegovina, Hungary and Iran. For Bahrain, documents are only made available in Arabic.

With the updated data, we reproduced Figures 7 and 8 in the main text (Figures A5 and A6). Note that all countries with changes in laws due to applicable non-binding documents fall into the "More Education" category. The changes are minimal. The relation between law and quality of product remains statistically insignificant, and relation between law and integrity of process remains statistically significant.

Figure A5. Quality of Product and Law in More Educated Countries

Figure A6. Integrity and Law in More Educated Countries
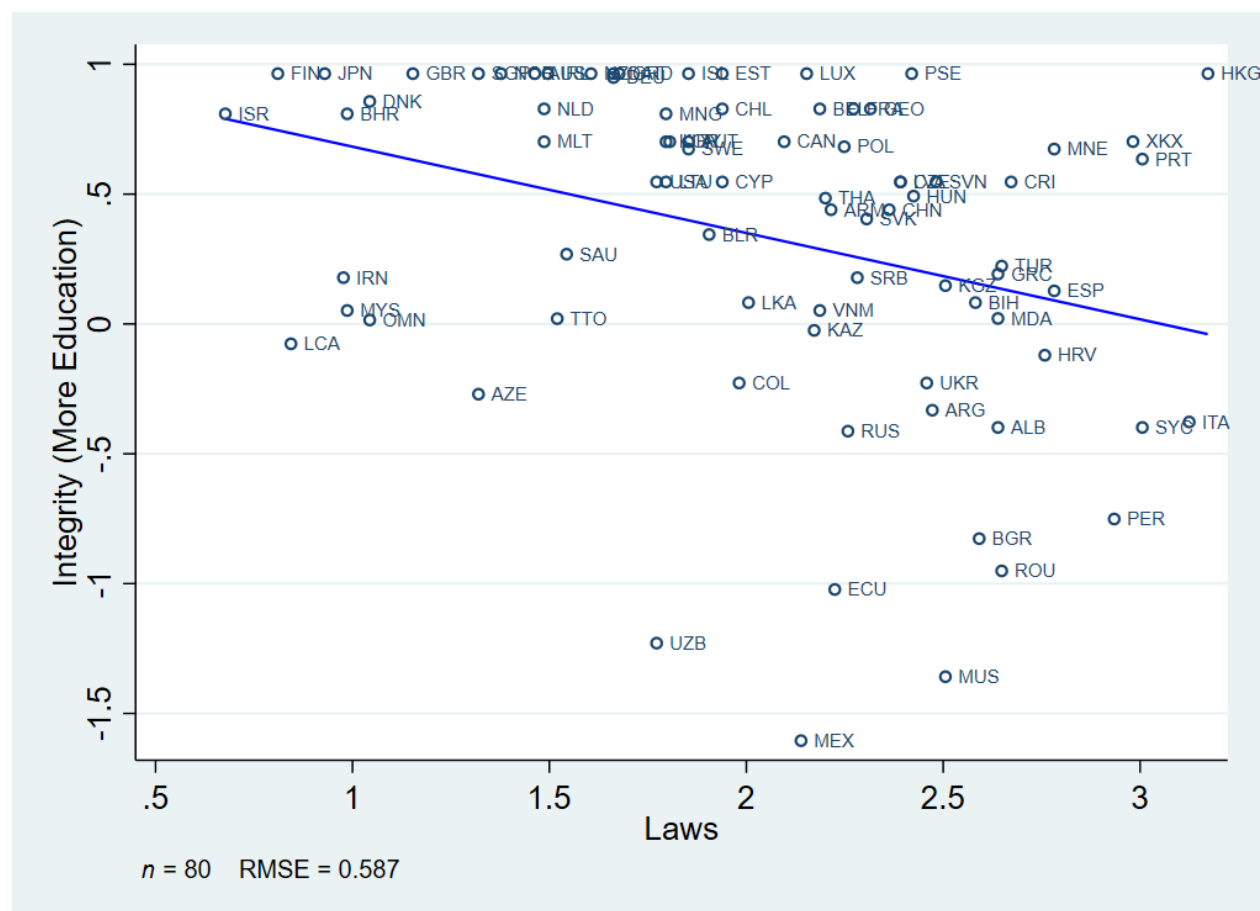
Laws and Practices: Variable Construction and Examples

On transparency, respondents are asked seven yes/no questions to determine whether the law requires PEs to publish the following seven documents: procurement plans, model procurement documents and standard contract conditions, tender notices, tender documents and technical specifications, notices of award and bidding results, contracts, and contract amendments. To build the transparency index, each "yes" answer is given a score of 1 and each "no" a score of 0. The transparency law index is the average of the scores for each question.

   As an example, in Argentina, PEs are not mandated by law to publish annual procurement plans (a score of 0), but all documents related to the procurement process *stricto sensu*—model documents, tender notices, tender documents, and awards—must be published (a score of 1 for

each of these four documents). Neither the contract itself nor subsequent modifications must be published by law (a score of 0 for each of these two sets of documents). Argentina scores 4 out of 7 points in the transparency law index, for an average of 0.57.

Respondents are also asked seven mirroring practice questions, again with yes/no answers, measuring whether the same documents are in fact readily available to bidders in more than 50 percent of procurement processes. For example, the mirroring practice question asks: "In practice, are tender notices made publicly available online by the procuring entity?". Respondents are asked to supplement their answers with links to the materials (model documents, tender notices, tender documents, and awards). The team verifies such links directly before coding a "yes" answer. The transparency practice index is built by attributing a score of 1 to each "yes" answer and 0 to each "no."

Again, in Argentina public procurement plans are not available in practice (a score of 0). Model documents and tender notices are publicly available (1 for each), but PEs do not publish tender documents and awards despite a legal obligation to do so (0 for each). Contracts and contract amendments are not published either (0 for each). Argentina thus scores 2 out of 7 points in the transparency practice, for an average of 0.29.

In more than a fourth of the sample—52 countries—the PE is not required by law to publish the award, so that the results of the auction are made available only to the winning bidder, and losing contractors are deprived of an opportunity to understand—and challenge—the reasons behind their loss. In several countries, documents are not published despite a legal obligation to do so. Argentine law mandates the publication of tender documents, but the relevant PE makes them available only upon payment of a fee. Conversely, in some countries the law does not mandate publication, but documents are nonetheless available. In the United Kingdom, for example, the law requires PEs to prepare annual procurement plans but does not mandate their publication, yet PEs choose to put them on their website.

The competition law index asks six questions related to legal provisions favoring competition throughout the procurement process (and there are six parallel practice questions). The first question asks respondents to indicate whether, according to the law, open tendering is the default method of procurement for a routine road resurfacing contract. Open tendering is defined as the

process in which any interested firm may submit a bid in response to a call for competition. A "yes" carries a score of 1 and "no" 0. The mirror question about practice asks whether the majority of road resurfacing contracts are in fact procured through open tendering. Respondents are presented with three answer options: (i) open tendering is the default by law and also the most common in practice, (ii) open tendering is not the default by law but is the most common in practice, and (iii) other methods of procurement (e.g., restricted tendering, direct award, reverse auctions, competitive dialogue) are the most common. Answer options (i) and (ii) are coded as "yes," with a score of 1; (iii) is coded as "no," with a score of 0.

In many European countries the law gives PEs the discretion to choose between open and restricted tendering (a score of 0 if open tendering is the default by law), but open tendering is still most frequently used (a score of 1 if it is the most common practice). In France the use of open tendering is discretionary (a score of 0), but the PE introduced a guideline—not mandatory, but strictly followed—imposing the use of open tendering for all contracts above €1,000,000 (a score of 1 for open tendering as the most common practice).

The second question asks whether, in an open tendering procedure, the PE can require bidders to participate in a prequalification process. A "yes" answer corresponds to a score of 1, "no" a score of 0. The mirroring practice question asks respondents if prequalification is used in more than 25 percent of cases. That is the case in 104 of 187 countries.

The third question asks whether the legal framework prohibits dividing contracts to circumvent thresholds for open tendering. The obligation for PEs to use open tendering is usually tied to a monetary threshold, but they may circumvent the threshold by splitting the contract and then using a non-open procedure that limits competition. A score of 1 is given if dividing contracts is forbidden by law, a score of 0 if it is not. The practice question asks how often contracts are divided to circumvent procurement rules. If this occurs in less than 25 percent of cases, the score is 1, otherwise it is 0. This phenomenon is extremely widespread—62 countries scored 0 in practice. Respondents in Mali and Sudan, for example, explained that procuring entities frequently split works into several contracts to award them to contractors of their choice with little or no publicity.

The fourth question asks whether the law mandates a minimum time limit between the advertisement of the tender notice and the submission deadline for an open tendering procedure (a

score of 1). In the absence of such a rule, a procuring entity can limit competition by setting demanding technical specifications and imposing a tight timeline. In Bulgaria, the Agency for Road Maintenance posted a €100 million procurement notice on December 29, 2016, to solicit bids for the construction of an electronic toll system; the closing date for bids was January 4, 2017. Not surprisingly, only one firm met the deadline. The practice question asks how often the PE does not advertise procurement opportunities with enough notice, thus restricting competition. If rarely or very rarely, the score is 1. If occasionally, often, or very often, the score is 0.

The fifth question in the competition law index asks whether the legal framework requires the PE to proceed to bid opening immediately after the deadline for bid submission has been reached. A score of 1 is attributed to a "yes" answer, 0 to "no." The mirror practice question asks whether bids are immediately opened in practice; 1 if "yes," 0 if "no."

The sixth question asks whether there is a standstill period between public notice of an award and the contract signing, suspending the procurement process to allow unsuccessful bidders to challenge the award decision. A score of 1 is attributed to a "yes" answer, 0 to "no." The mirroring practice question asks whether the filing of a challenge against the award does in fact suspend the process (a score of 1). In Lao PDR, for instance, open tendering is the default method of procurement (a score of 1), the PE can require bidders to participate in a prequalification process (a score of 1), the legal framework mandates a minimum time limit between the advertisement of the tender notice and the submission deadline (a score of 1), the division of contracts is forbidden (a score of 1), and a standstill is regulated by law (a score of 1). Lao PDR thus scores 5 out of 6, with an average of 0.83 on the competition law index. Practice, however, lags behind. Even though open tendering is the default by law, PEs prefer to use prequalification to prescreen candidates (a score of 1 in prequalification). In more than 90 percent of procurement processes, the PE does not advertise procurement opportunities long enough (a score of 0) and bid opening is not carried out immediately (a score of 0). The division of contracts in practice is uncommon, and challenges usually suspend the award process (a score of 1 in each). With 3 out of 6 points, Lao PDR's score on the competition practice index is 0.5.

Questions about limits to exclusion, both by law and in practice, look at five issues. The first question asks whether the legal framework establishes the minimum content of the tender notice and tender documents, a score of 1 if "yes", 0 if "no".

In Bangladesh and the Russian Federation technical specifications are often drafted so narrowly that only one company satisfies them. These can include a specific type of asphalt with no obvious quality advantage that only one company in the country produces, for example, or a requirement to have performed the exact same contract for the PE in the last 7 years, creating an intrinsic and recurrent bias toward a single contractor. The practice question asks how often the PE defines technical specifications to benefit a specific bidder. If in less than 25 percent of cases, the score is 1, otherwise 0.

The second question asks whether the law requires the PE to make clarifications publicly available to everyone (including to companies that did not participate in the bidding process) to minimize one-on-one interactions with bidders. Respondents have five answer options: the PE (i) addresses all clarifications in a public meeting; (ii) must answer and communicate the answer to all other bidders; (iii) must answer, but is not always required to communicate the answer to all other bidders; (iv) answers only the relevant bidder; and (v) other. A score of 1 is given if the procuring entity must address all clarifications in a public meeting, making it more difficult to exclude bidders and minimizing one-on-one interactions; a score of 0 otherwise. The mirroring practice question asks how often the PE holds informal meetings with individual bidders. If in less than 25 percent of cases, a score of 1, otherwise 0.

The third question asks which award criterion is used for a routine road maintenance contract by law: (i) price, (ii) price and other elements (i.e., best value for money), or (iii) the choice is left to the discretion of the PE. Using price as the only award criterion makes it harder for the PE to exclude bidders, earning a score of 1; all other options make it easier, scoring 0. The mirroring practice question asks how often the award decision is based solely on price and not on best value for money. If in more than 25 percent of cases, a score of 1, otherwise 0.

The fourth question examines whether the legal framework establishes a criterion to define an abnormally low bid, making it more difficult for the PE to exclude bidders (a score of 1). The practice question asks how often private sector companies submit recklessly low bids to win the tender. A score of 1 is recorded if rarely or very rarely, and 0 in all other cases.

The fifth question asks whether the legal framework defines what constitutes a nonsubstantial error. Regulating nonsubstantial errors makes it more difficult for the PE to exclude, earning a

score of 1. The practice question asks whether the bidder would be given the opportunity to rectify such errors before disqualification. If so, it is harder for the PE to exclude (a score of 1); if not, it is easier (a score of 0).

Last, the integrity of contract indices by law and in practice look at six types of restrictions on the PE's discretion during the life of the contract. The first is whether, by law, the PE is required to have already allocated budget to a specific project before tendering. Respondents are presented with three answer options: (i) yes, there is a specific budget allocation; (ii) yes, a budget certificate is required; and (iii) no. If the law requires a specific budget allocation and/or certificate, the answer is coded "yes," a score of 1. If no such legal requirement exists, the answer is "no" and the score is 0. The practice question asks the percentage of cases in which the procuring entity awards a contract without having already set aside all the necessary funds. If this happens in less than 25 percent of cases (i.e., rarely or very rarely), a score of 1 is assigned, 0 otherwise. Data from Tunisia revealed that without a specific budget allocation or a certificate securing funds for each tendered project, procuring entities find themselves with invoices they cannot pay. In fact, it is not unusual for the PE to have to return part of its budget before the end of the fiscal year, leaving it exposed to payments it cannot make. Delays in payment create considerable slowdowns, as contractors stop working until they are paid.

The second element relates to subcontracting. Respondents are asked to indicate which of the following three dimensions of subcontracting is regulated by law: (i) features (the administrative process to subcontract, limits of subcontracting, authorizations required, etc.), (ii) disclosure (when and how companies should inform the PE of their intent to subcontract), and (iii) liability (the responsibility of the contractor and subcontractor in case of poor performance). The answer is coded "yes" (a score of 1) only when all three aspects are regulated; all other options are coded "no" (a score of 0). The practice question asks respondents to identify whether contractors frequently employ subcontractors that were neither properly selected nor disclosed during the tendering process (a score of 0 if this happens in more than 25 percent of contracts).

The next two elements relate to contract execution. Respondents are asked to indicate how renegotiations and additional works are regulated. Renegotiations are defined as substantial changes to the original contract terms that lead to new contract clauses. Respondents are asked to indicate whether any of the following key aspects of renegotiation – process, limits, and disclosure

requirements – is regulated (a score of 1). The mirroring practice question gauges how often the renegotiation process is abused to increase the price or the scope of the project without another competitive process. If rarely or very rarely, the score is 1, otherwise 0.

Additional works are defined as all complementary works not included in the initial contract or tender documents but related to the initial work and thus awarded to the same contractor. The need for such work usually becomes apparent during the execution of the original contract and the work is awarded to the original contractor through noncompetitive methods of procurement. The law question asks whether additional work can be procured through direct award (a score of 1) or whether complete discretion is left to the PE on the process to award such works (a score of 0). The mirroring practice question tests whether additional works are in fact awarded through noncompetitive measures in more than 25 percent of cases. If rarely or very rarely, a score of 1 is assigned, otherwise 0. In many countries, renegotiations and additional work are completely unregulated.

The fifth and sixth elements relate to payment and ask whether the legal framework establishes a timeframe within which the procuring entity must process payment once an invoice is received (a score of 1 if "yes," 0 if "no") and whether the company is entitled to claim interest on late payments if the PE does not pay within the legally established timeframe (a score of 1 if "yes," 0 if "no"). The practice questions ask how often payment is processed in the legally mandated timeframe and how often interest on late payments is actually paid. If payments are made on time in more than 50 percent of cases ("often" or "very often"), a score of 1 is recorded; if not, 0. The same coding applies if interest on late payments is actually paid to companies in more than half of the procurement processes.

In Singapore, the law does not require the PE to have already allocated budget before tendering (a score of 0), but the PE usually does so in practice (a score of 1). Subcontracting, renegotiations, and additional work are completely unregulated (a score of 0 on each of these three questions in the integrity of contract law index). The subcontracting and renegotiation processes in practice are not abused by the procuring entity (a score of 1 in each) and direct awards for additional work are unusual (a score of 1). The law does not specify a deadline for payment of invoices (a score of 0) but does mandate the payment of interest on late payments (a score of 1). In practice, payments are timely in more than 90 percent of cases (a score of 1), but interest is rarely paid (a score of 0).

Singapore scores 1 out of 6 on the integrity of contract law index, or 0.17. In practice, it scores 5 out of 6, or 0.83.

The law and practice indices are the sums of their four subindices. Note that this exercise differs significantly from an earlier World Bank dataset named Benchmarking Public Procurement. The latter measured central procurement by default, did not identify a specific entity, measured larger projects, and measured only supra-national rules in several country (e.g. the European Union).

Outcomes

The outcomes we measure are Quality of Product and Integrity of Process.

Construction of the quality index involves inputs on time, cost overruns and project quality. The quality index is the average of the z-scores of these three variables (time, cost overruns, project quality). High scores signify good outcomes. Questions on time benchmark the efficiency of the procurement process from the moment the procuring entity decides to advertise the procurement opportunity until the contract is successfully executed and the last payment is made. Time is measured for two phases of the procurement lifecycle: the bidding phase, which covers all interactions between the advertisement of the procurement opportunity and the commencement of the work measured in the case study, and the contract management phase, which measures all interactions with government agencies that delay the execution of the contract. The measure captures the median duration in calendar days that respondents indicate is necessary in practice to complete a procedure with minimum follow-up with government agencies and includes all typical delays that a construction company would experience when dealing with the procuring entity. Time equals log(Number of days).

The bidding process can take as few as 149 days in Taiwan or as many as 801 days in Guinea-Bissau, where just obtaining permits and a notice to begin work takes 420 days. During the execution of the contract, inspections and payment are the largest sources of delay. Obtaining payment takes a year in Haiti and Iran, and in Mongolia and Mozambique companies are left waiting more than nine months for an inspection.

The question on overruns measures how often the project is delivered within the original budget. Respondents are presented with the same answer options as for other frequency questions,

with a high score if works are delivered within the original budget. In 7 countries in the sample, including Argentina, Ecuador, and Malawi, the original budget estimate is met in less than 10 percent of procurement cases. In another 37 countries, including Serbia and Tunisia, it is met in less than 25 percent of road procurement contracts. Fiji, Lichtenstein, and Singapore are three of only 5 countries in the sample where the original budget is met in more than 90 percent of contracts.

The question on the project quality asks how often the contract is executed with less quality or with different technical specifications than those submitted during the tender process. In Malawi and Pakistan, more than 90 percent of road projects are delivered with lower than expected quality, whereas in Australia, Japan, and 24 other countries this occurs in less than 10 percent of cases. The variable is scored by taking the average of the answer category; for example Malawi scores 0.95, while Australia scores 0.05.

Several questions go into the measure of integrity as well, and for each one respondents are again presented with five answer options: (i) very rarely (in less than 10 percent of cases), (ii) rarely (10–25 percent of cases), (iii) occasionally (25–50 percent of cases), (iv) often (50–90 percent of cases), or (v) very often (more than 90 percent of cases). Integrity is scored by taking the average of the answer category. Again, high scores signify good outcomes.

The favoritism variable measures how often procuring entities circumvent public procurement rules by interpreting selection criteria in a way that favors a specific bidder. In 102 countries, including Canada and Denmark, this happens in less than 25 percent of cases. In Ecuador and Mexico, favoritism characterizes more than 90 percent of procurement projects.

The question on collusion asks whether procuring entities and private sector companies prevent market entry to other competitors. Collusion is prominent in eastern Europe; in several countries— including Romania and Uzbekistan—it plagues more than 50 percent of all road procurement contracts.

The absence of competition in procurement is assessed by how often noncompetitive procurement methods are used instead of open tendering. In 27 countries in the sample, noncompetitive procurement methods instead of open tendering are used in more than 50 percent

of contracts, with peaks of more than 90 percent of contracts in Angola, Lao PDR and Niger. In Israel and New Zealand, only 10 percent of contracts use methods other than open tendering.

The question on corruption measures how often bribing happens. In Bolivia, bidders resort to bribes in 50–90 percent of road procurement cases; in Myanmar bribes are reported in more than 90 percent of such cases. The variable is scored by taking the average of the answer category, for example Bolivia scores 0.70 and Myanmar 0.95. High scores mean bad outcomes.

Integrity is the average of the z-scores of the four variables. On integrity, Lao PDR, Myanmar and Niger are the worst performers, while the best are Australia, Dominica and Estonia.

Other Outcome Variables

We use two other variables as outcomes, and describe them below. In addition, the World Bank in collaboration with the Global Transparency Institute, released in July 2021 a new measure of Integrity similar to our own, and we briefly describe it below, although we do not use it in the paper. Figures A7 and A8 display the correlation of these three outcome variables with the laws and practice indices.

The World Economic Forum's (2019) survey asks about the quality of road infrastructure: "In your country, how is the quality (extensiveness and condition) of road infrastructure [1 = extremely poor—among the worst in the world; 7 = extremely good—among the best in the world]?".

To proxy the overall quality of roads, we use average the average intracity travel speed using traffic dependent measure of duration with nighttime departure calculated through Google Maps Distance Matrix API (Application Programming Interface). To use the API, we provide an origin, destination, planned departure time, and an indicator to avoid highways. The API returns the driving distance using the shortest route between the origin and destination, the expected traffic-independent travel time[3], and the expected travel time using traffic data history at the planned departure time[4].

---

[3] This does not depend on the planned departure time, as the departure time is used only for traffic information.
[4] Traffic dependent travel time information is only returned if Google has adequate traffic data along the planned route. If there is insufficient traffic data, then the API only returns the traffic-independent expected travel time.

To estimate the travel speed for an entire country, we compared travel time within the three largest cities. This eliminates potential biases that may arise in travel between major cities as this may be highly dependent on how close major cities in a given country are to each other. We use a nighttime departure (i.e. the time is set to 1:00 AM local time at the origin) to avoid cases of high traffic, and we exclude highways. Since the API requires a specific date of travel, we choose this date to be June 1, 2021 as the departure time at which to estimate average travel speed. To analyze the driving speed in a city, we examine the travel time between a northern point of a city to a southern point of a city. We adopt a heuristic of estimating the travel time from 0.1 degrees north of the city center to 0.1 degrees south of the city center. The Google Maps API will generally pick the nearest accessible point to travel to for a given coordinate. This estimates north-south travel speed over approximately 14 miles (1-degree latitude is approximately 70 miles), which is typically still in the city or surrounding areas.

Data from the Global Transparency Institute's (GTI) collaboration with the World Bank are used to create an Integrity index which covers favoritism and corruption in procurement (see Fazekas 2021 for details about the GTI database). The index is based on a dataset of 1.2 million construction contracts awarded after the year 2000 in 171 countries. Only contracts worth $100,000 or more are considered. Again, higher scores indicate better outcomes (e.g., less favoritism, less corruption).

Eight questions, divided into two subindices – Favoritism and Bribes – go into the measure of Integrity GTI. Again, high scores signify good outcomes. Integrity GTI is the z-score of the two subindices. The favoritism subindex measures how often procuring entities circumvent public procurement rules by interpreting selection criteria in a way that favors a specific bidder. Favoritism GTI is based on four questions – is the call for tender unpublished, is the length of advertisement period too short, is the length of decision period too short, and is the supplier's share in annual public procurement significant. The Bribes GTI subindex measures how often bribing happens. High scores mean good outcomes. The subindex is based on four questions – is non-open procedure the prevalent method of procurement, is there a single bidder, is there evidence of price manipulation, and is the supplier registered in a tax haven.

Control Variables

Two control variables feature in the analysis. The World Bank's human capital index measures the amount of human capital that a child born today can expect to attain by age 18, given the risks of poor health and poor education that prevail in the country where she lives (Angrist et al. 2021). Government effectiveness, from the World Bank (2020) World Development Indicators, is based on unobserved components model using 33 data sources that are rescaled and combined to create an aggregate indicator. The measure captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
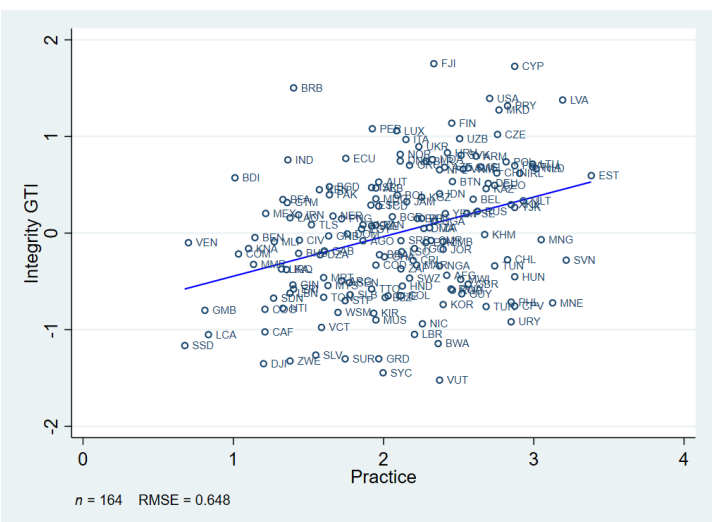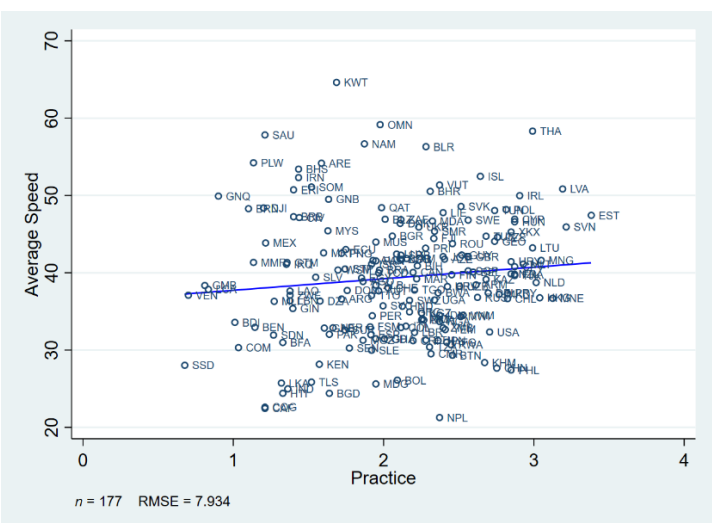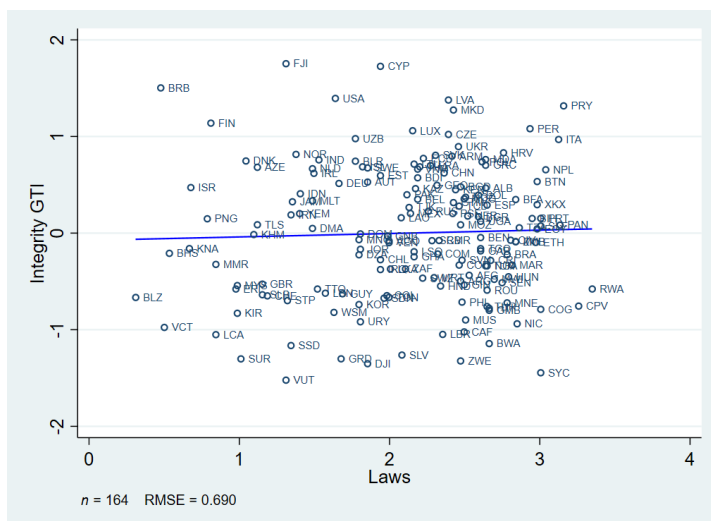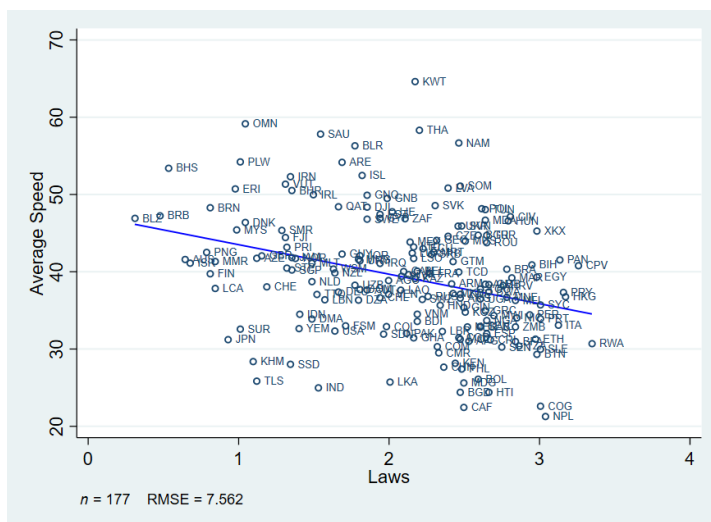
Figure A7. Road Quality, Average Speed, Integrity GTI, and Practice
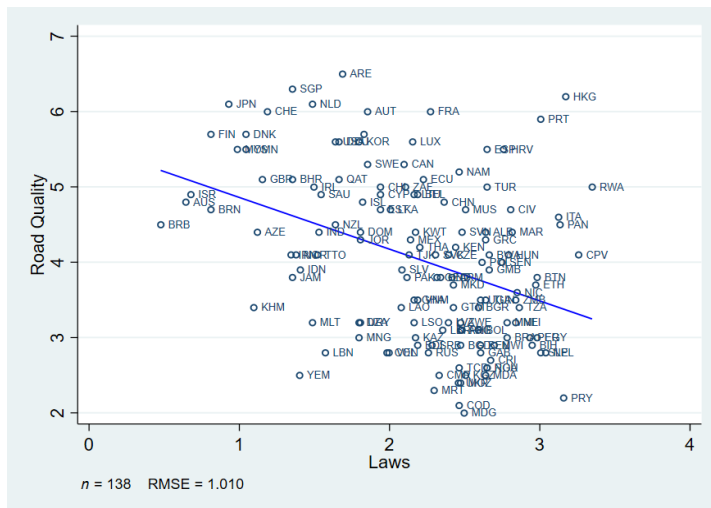
Figure A8. Road Quality, Average Speed, Integrity GTI, and Laws

Appendix B: Robustness of Correlations Shown in Figures in Regressions with Controls

Figure 8 shows that Integrity and Quality weakly improve with stricter laws in countries with lower educational attainment, but decrease with stricter laws in countries with higher educational attainment and human capital as measured by HCI. Table B1 confirms these findings controlling for human capital.

Table B1: Laws and Outcomes controlling for Education

	Less Educated		More Educated	
	Integrity	Quality	Integrity	Quality
Laws	0.144	0.196*	-0.209**	-0.012
	(0.146)	(0.104)	(0.095)	(0.084)
HCI	4.408***	3.003***	3.695***	4.850***
	(1.231)	(0.946)	(0.747)	(0.693)
N	83	85	80	85
R^2	0.138	0.121	0.319	0.381

(standard errors in parentheses)

We next split the sample at the median education level and compare the mean levels of laws and practice across countries (Table B2). In our data, practice is stricter than laws in higher PSC countries, and the reverse is true in lower PSC ones.

Table B2 Practice and Laws in Less and More Educated Countries

Less Educated			More Educated			Probability (Practice - Laws) is Higher in High H.C. Countries
Laws	Practice	Prob. Laws = Practice (t-score)	Laws	Practice	Prob. Laws = Practice (t-score)	
2.209	1.897	0.000	1.984	2.318	0.000	1.000
(0.069)	(0.055)	(3.726)	(0.071)	(0.059)	(-4.415)	(5.723)

Table B3 shows that human capital and government effectiveness are strongly correlated with the Integrity and Quality, holding procurement laws constant.

Table B3: Human capital and Government Effectiveness correlated with Integrity and Quality

	Integrity			Quality		
Laws	-0.053 (0.087)	-0.067 (0.077)	-0.030 (0.085)	0.083 (0.068)	0.075 (0.065)	0.102 (0.067)
Human Capital	3.062*** (0.384)		0.915 (0.725)	2.792*** (0.321)		1.272** (0.611)
Gov. Efficiency		0.493*** (0.052)	0.374*** (0.108)		0.454*** (0.046)	0.260*** (0.090)
N	163	177	163	170	186	170
R^2	0.308	0.364	0.356	0.314	0.353	0.347

Table B4 shows that the interactions between the law index and education are negative and statistically significant with either Integrity or Quality as dependent variables.

Table B4. Interactions of Laws and Education

	Integrity			Quality		
Laws	-0.034 (0.087)	0.005 (0.085)	0.008 (0.086)	0.101 (0.066)	0.083 (0.067)	0.081 (0.069)
Human Capital	3.157*** (0.384)	0.422 (0.856)	0.217 (0.825)	2.883*** (0.312)	2.434*** (0.710)	2.061*** (0.695)
Human Capital* Laws	-1.164* (0.592)	-0.687 (0.620)		-1.649*** (0.475)	-1.167** (0.514)	
Gov. Eff		0.214 (0.131)	0.241* (0.124)		0.261** (0.108)	0.330*** (0.104)
Gov. Eff.*Laws			-0.097 (0.085)			-0.073 (0.069)
Log GDP		0.166** (0.082)	0.162** (0.082)		-0.124* (0.069)	-0.140** (0.069)
N	163	163	163	170	170	170
R^2	0.325	0.375	0.376	0.360	0.384	0.369

Appendix C: The Components of Laws and Practice

Table C1 presents the correlations between the four measures of the laws index, the laws index itself, and the log of per capita income. Across countries, different aspects of the regulation of procurement are strongly positively correlated with each other. But we also get the first surprising result: regulation is generally less restrictive in richer countries: the correlation coefficient with per capita income is -0.315, so richer countries give their PE's more discretion. They are particularly prone to have fewer laws regulating competition and integrity of contract.

Table C1: Correlations between components of the laws index

	Transparency	Competition	Integrity of contract	Limits to exclusion	Log GDP	Laws
Transparency	1					
Competition	0.330***	1				
Integrity of contract	0.426***	0.465***	1			
Limits to exclusion	0.459***	0.315***	0.343***	1		
Log GDP	-0.080	-0.442***	-0.264***	-0.124*	1	
Laws	0.743***	0.718***	0.795***	0.684***	-0.315***	1

Table C2 shows that practices across multiple dimensions of procurement regulation are highly positively correlated with each other. We also find that practices are less discretionary in richer countries, with correlation coefficient of 0.332 – the opposite of the finding for laws.

Table C2: Correlations between components of the practice index

	Transparency	Competition	Integrity of contract	Limits to exclusion	Log GDP	Practice
Transparency	1					
Competition	0.290***	1				
Integrity of contract	0.067	0.158**	1			
Limits to exclusion	-0.082	0.226***	0.445***	1		
Log GDP	0.071	0.070	0.360***	0.303***	1	
Practice	0.557***	0.603***	0.670***	0.648***	0.332***	1

Are these outcomes correlated with the laws and practice of procurement regulation? Table C3 shows the correlations between corruption, Quality, and Integrity for both laws (odd columns) and practice (even columns). Corruption is negatively correlated with laws and positively correlated with practice, and the correlation with practices is stronger. Both Quality and Integrity are robustly positively correlated with all the practice variables, except for the transparency indicator and

Integrity. In contrast, the correlations with the laws variable are weak, and often negative: countries with more legal controls of PE's have no better and perhaps worse outcomes.

Table C3: Correlations between Law and Practice and Outcome Variables

	Corruption and Laws	Corruption and Practice	Integrity of Process and Laws	Integrity of Process and Practice	Quality of Process and Laws	Quality of Process and Practice
Overall Index	-0.157**	0.564***	-0.181**	0.552***	-0.069	0.531***
Transparency	0.034	0.120	-0.049	0.017	0.058	0.179**
Competition	-0.228***	0.275***	-0.162**	0.244***	-0.118	0.129*
Limits to Exclusion	-0.057	0.453***	-0.094	0.540***	0.023	0.333***
Integrity of Contract	-0.173**	0.579***	-0.194***	0.592***	-0.137*	0.656***

Table C4 exhibits the results for laws and practice in countries with different levels of human capital for the four distinct elements of laws and practice. In low capacity countries, laws are stricter than practice for transparency, competition, and integrity of contract (though not for limits of exclusion). In better educated countries, laws are less binding than practice for transparency and exclusion, though not for competition and the integrity of contract. But in our ultimate test of laws vs practice in educated vs uneducated countries, we find the same result for every sub-index as we do for the overall index of laws.

Table C4: Laws and practice in countries with different levels of education

	Less Educated			More Educated			Probability (Practice - Laws) is Higher in High H.C. Countries
	Laws	Practice	Prob. Laws = Practice (t-score)	Laws	Practice	Prob. Laws = Practice (t-score)	
Transparency	0.477 (0.021)	0.418 (0.028)	0.013 2.547	0.492 (0.026)	0.513 (0.029)	0.237 -1.191	0.997 2.758
Competition	0.718 (0.023)	0.588 (0.020)	0.000 4.722	0.582 (0.022)	0.621 (0.017)	0.080 -1.773	1.000 4.805
Limits to Exclusion	0.369 (0.023)	0.543 (0.028)	0.000 -4.779	0.362 (0.020)	0.670 (0.027)	0.000 -8.972	0.996 2.689
Integrity of contract	0.645 (0.030)	0.348 (0.021)	0.000 8.095	0.547 (0.028)	0.514 (0.024)	0.382 0.879	1.000 5.038

N = 85 for each H.C. group.

Table C5 examines the impact of these interaction terms on the seven components of Quality and Integrity (recall that the variables here are coded so that higher values mean better outcomes). All interaction coefficients, except for corruption, are negative. Four of the regressions show

interactions that are statistically significant and economically meaningful. The interaction is not significant for the project quality, no competition and corruption outcomes.

Table C5. Regressions with Interactions

	Time	Overrun	Project Quality	No Competition	Favoritism	Collusion	Corruption
Laws	65.48***	0.018	-0.016	-0.002	-0.033	0.003	0.013
	(24.72)	(0.025)	(0.027)	(0.028)	(0.029)	(0.024)	(0.030)
Human Capital	930.3***	0.449***	0.658***	0.811***	0.530***	0.483***	1.410***
	(116.5)	(0.117)	(0.117)	(0.122)	(0.129)	(0.103)	(0.132)
Human Capital*Laws	-324.8*	-0.547***	-0.233	-0.268	-0.397**	-0.441***	0.0367
	(177.3)	(0.180)	(0.182)	(0.187)	(0.199)	(0.160)	(0.203)
N	170	168	163	161	161	160	160
R^2	0.283	0.117	0.194	0.237	0.139	0.156	0.445

Appendix D: Proofs of Propositions

Proof of Proposition 1: In a simple second price auction with known costs and no exclusion, both bidders bid their costs. If $K_0 < K_I$ then the outsider also receives the contract under the second price auction. In that case, consumer surplus is $Q_0 - K_I$ and the PE's welfare is $\alpha(Q_0 - K_I)$ as there is no scope for bribes. If $K_0 > K_I$, then the insider wins the auction, consumer surplus is $Q_I - K_0$, and the PE's welfare is $\alpha(Q_I - K_0)$.

In the excludable auction case, we begin with the default action of the PE if no bribe is paid.

If $K_0 < K_I$, then the exclusion of the outsider is the default if and only if $Q_I - Q_0 > C_{max} - K_I$.

If $K_0 < K_I$, and $\Delta < -(C_{max} - K_I)$, then the insider pays no bribes because he knows that the outsider will be excluded if a bargain is not reached. Exclusion is socially optimal and occurs without any bribes.

If $K_0 < K_I$ and $-\Delta < C_{max} - K_I$, then a corrupt bargain to exclude the outsider selects the bribe to maximize $(\alpha(Q_I - C_{max}) + B - \alpha(Q_0 - K_1))^\beta (C_{max} - \theta B - K_I)^{1-\beta}$, subject to the constraint that $\frac{C_{max}-K_I}{\theta} \geq B \geq \alpha(C_{max} - K_I + Q_0 - Q_I)$, which requires that $\left(\frac{1}{\alpha\theta} - 1\right)(C_{max} - K_I) > \Delta$. In that case, the bribe is $\left(\frac{\beta}{\theta} + (1-\beta)\alpha\right)(C_{max} - K_I) + (1-\beta)\alpha\Delta$ and consumer surplus is $Q_I - C_{max} < Q_0 - K_I$. If $\left(\frac{1}{\alpha\theta} - 1\right)(C_{max} - K_I) < \Delta$, then both entities remain in the auction and consumer surplus is unchanged with discretion.

If $K_0 > K_I$, then the procuring entity will exclude the insider if and only if $\Delta > C_{max} - K_0$.

If $K_0 > K_I$, then there are two corrupt possibilities: (1) the insider and outsider both remain in the auction even though the socially optimal outcome is to exclude the insider, and (2) the insider remains and the outsider is excluded.

If $K_0 > K_I$ and $\Delta < C_{max} - K_0$, then the insider wins the auction with or without bribery. Consequently, a corrupt bargain to exclude the outsider selects the bribe that maximizes $(\alpha(Q_I - C_{max}) + B - \alpha(Q_I - K_0))^\beta (C_{max} - \theta B - K_0)^{1-\beta}$, subject to the constraints that $\frac{C_{max}-K_0}{\theta} \geq B \geq \alpha(C_{max} - K_0)$, or $1 \geq \theta\alpha$. In this case, the bribe equals $\left(\frac{\beta}{\theta} + (1-\beta)\alpha\right)(C_{max} - K_I) = B$.

If $K_0 > K_I$ and $\Delta > C_{max} - K_0$, then the insider is excluded from the auction if there are no bribes. Bribery can either leave both bidders in the auction or exclude the outsider.

If the outsider is excluded, then the bargain maximizes $(\alpha(Q_I - C_{max}) + B - \alpha(Q_0 - C_{max}))^\beta (C_{max} - \theta B - K_I)^{1-\beta}$, subject to the constraint that $\frac{C_{max}-K_I}{\theta} \geq B \geq \alpha\Delta$. The bribe level satisfies $B = (1-\beta)\alpha(Q_0 - Q_I) + \frac{\beta}{\theta}(C_{max} - K_I)$, so that joint welfare is $\beta^\beta(1-\beta)^{1-\beta}\left(\alpha(Q_I - Q_0) + \frac{1}{\theta}(C_{max} - K_I)\right)$.

If the outsider is included then the bargain maximizes $(\alpha(Q_I - K_O) + B - \alpha(Q_O - C_{max}))^\beta (K_O - \theta B - K_I)^{1-\beta}$, subject to the constraint that $\frac{K_O - K_I}{\theta} \geq B \geq \alpha(Q_O - Q_I + K_O - C_{max})$, which requires $\frac{K_O - K_I}{\alpha\theta} + C_{max} - K_O \geq Q_O - Q_I$. The bribe satisfies $B = (1 - \beta)\alpha(Q_O - Q_I + K_O - C_{max}) + \frac{\beta}{\theta}(K_O - K_I)$, so that joint welfare is $\beta^\beta (1 - \beta)^{1-\beta} \left(\alpha(Q_I - Q_O + C_{max} - K_O) + \frac{1}{\theta}(K_O - K_I) \right)$. Joint welfare is higher in the corrupt bargain if the outsider is excluded if and only if $1 > \alpha\theta$.

Putting these conditions together, if $1 > \alpha\theta$, then a corrupt bargain to exclude the outsider and keep the insider occurs if and only if $\frac{C_{max} - K_I}{\alpha\theta} \geq \Delta$. In that case, social losses relative to the simple second price auction equal $C_{max} - K_O$. If $\frac{C_{max} - K_I}{\alpha\theta} < \Delta$, then the outsider is kept, the insider is excluded, and there are social gains from discretion.

If $1 < \alpha\theta$, then a corrupt bargain to keep the insider occurs if and only if $C_{max} - K_O + \frac{K_O - K_I}{\alpha\theta} \geq \Delta$, but in this case the bargain just replicates the simple second price auction, so there are no social welfare losses. If $1 < \alpha\theta$ and $C_{max} - K_O + \frac{K_O - K_I}{\alpha\theta} < \Delta$, the insider is excluded and there are social gains of $Q_O - Q_I + K_O - C_{max}$ relative to the simple second price auction. If $1 < \alpha\theta$ then $C_{max} - K_O + \frac{K_O - K_I}{\alpha\theta} > \frac{C_{max} - K_I}{\alpha\theta}$ and if $1 > \alpha\theta$ then $C_{max} - K_O + \frac{K_O - K_I}{\alpha\theta} < \frac{C_{max} - K_I}{\alpha\theta}$, so discretion is beneficial if and only if $\Delta > Max\left[C_{max} - K_O + \frac{K_O - K_I}{\alpha\theta}, \frac{C_{max} - K_I}{\alpha\theta} \right]$. If $1 > \alpha\theta$ and $\frac{C_{max} - K_I}{\alpha\theta} \geq \Delta$, then discretion reduces consumer welfare. If $1 < \alpha\theta$ and $C_{max} - K_O + \frac{K_O - K_I}{\alpha\theta} \geq \Delta$, then discretion does not impact consumer welfare.

Proof of Proposition 2: If the insider has made a cost-cutting investment, he is a low-cost/low-quality provider: In a regulated second price auction without exclusion, the insider always reduces quality to win the bid. Consumer welfare is equal to $Q_O - \Delta - K_O$.

As $K_O > K_I$ and $\Delta > C_{max} - K_O$, then the insider is excluded from the auction if there are no bribes. Again, bribes can either leave both bidders in the auction or exclude the outsider.

Following the logic of the proof of proposition 1, if $1 > \alpha\theta$, then a corrupt bargain to exclude the outsider occurs if and only if $\frac{C_{max} - K_I}{\alpha\theta} \geq \Delta$. If $1 < \alpha\theta$ and $C_{max} - K_O + \frac{A}{\alpha\theta} > \Delta$, then there is a corrupt bargain with the insider, but as we assume that $\Delta > C_{max} - K_O + A$, there is never a corrupt bargain when $1 < \alpha\theta$ and so the insider earns zero profits if he has cut quality.

If $\frac{C_{max} - K_O + A}{\Delta} < \alpha\theta < 1$, then the insider is included and so earns zero profits. If $\frac{C_{max} - K_O + A}{\Delta} > \alpha\theta$, then the outsider is excluded, the insider wins the auction, pays a bribe of $(1 - \beta)\alpha\Delta + \frac{\beta}{\theta}(C_{max} - K_O + A)$, and so earns total profits of $(1 - \beta)(C_{max} - K_O + A - \alpha\theta\Delta)$.

If the insider does not cut costs, his quality is the same as the outsider's and $K_O < K_I$, so the default is not to exclude anyone and for the insider to earn zero profits. If $\alpha\theta > 1$, the outsider is not excluded and the insider loses the auction. If $\alpha\theta < 1$, the outsider is excluded and the insider wins and earns profits after bribes of $(1-\beta)(1-\alpha\theta)(C_{max} - K_O - A)$.

If $\alpha\theta > 1$, the insider earns zero profits whether or not he cuts costs. By assumption he does not make the investment and so is not excluded from the auction. The auction therefore yields consumer welfare of $Q_O - K_O - A > Q_O - \Delta - K_O$.

If $\frac{C_{max} - K_O + A}{\Delta} < \alpha\theta < 1$, the insider earns zero profits if he cuts costs, but positive profits if he does not. In this range, he does not invest and consumer welfare is $Q_O - C_{Max} > Q_O - \Delta - K_O$.

If $\frac{C_{max} - K_O + A}{\Delta} < \alpha\theta$, he earns profits after bribes of $(1-\beta)[(C_{max} - K_O - a) - (C_{max} - K_O - a)\alpha\theta]$ if he does not cut costs, and $(1-\beta)[(C_{max} - K_O + A) - \Delta\alpha\theta]$ if he does.

Discretion then leads to quality cuts if and only if $\alpha\theta < \frac{a+A}{\Delta - C_{max} + K_O + a} < \frac{C_{max} - K_O + A}{\Delta} < 0$. In that case, consumer welfare is $Q_O - \Delta - C_{max}$, which offers the worst case scenario of maximum price and minimum quality.

Proof of Proposition 3: A corrupt bargain can occur which will decide both on a bribe level and the level of transparency. The corrupt bargain if it occurs will maximize the joint surplus of both the PE and the contracting insider. If there is no bribe, the PE sets $\pi = 1$, since added competition reduces costs and raises social welfare. In that case, the insider receives zero profits. The insider's profits equal $C_{max} - K_I$.

If there is no law, a corrupt bargain to reduce transparency selects the bribe to maximize $(\alpha(1-\pi_L)(K_1 - C_{max}) + B)^\beta((1-\pi_L)(C_{max} - K_I) - \theta B)^{1-\beta}$, subject to the constraint that $\frac{(1-\pi)(C_{max} - K_I)}{\theta} \geq B \geq \alpha(1-\pi_L)(C_{max} - K_I)$, or $(C_{max} - K_I)\left(\frac{1}{\alpha\theta} - 1\right) \geq 0$. Hence if $\alpha\theta > 1$, the PE sets $\pi = 1$. If $\alpha\theta < 1$, the PE sets $\pi = \pi_L$, and the bribe is $B = \left(\frac{\beta}{\theta} + (1-\beta)\alpha\right)(1 - \pi_L)(C_{max} - K_I)$.

If there is a law, a corrupt bargain to reduce transparency selects the bribe to maximize $(\alpha(1-\pi_L)(K_I - C_{max}) + B - \alpha z)^\beta((1-\pi_L)(C_{max} - K_I) - \theta B)^{1-\beta}$, subject to the constraint that $\frac{(1-\pi)(C_{max} - K_I)}{\theta} \geq B \geq \alpha(1-\pi_L)(C_{max} - K_I) + \alpha z$, or $(C_{max} - K_I)\left(\frac{1}{\alpha\theta} - 1\right) \geq z$. Hence if $\alpha\theta > \frac{C_{max} - K_I}{C_{max} - K_I + z}$, the PE sets $\pi = 1$. If $\alpha\theta < \frac{C_{max} - K_I}{C_{max} - K_I + z}$, then the PE sets $\pi = \pi_L$, and the bribe is $B = \left(\frac{\beta}{\theta} + (1-\beta)\alpha\right)(1 - \pi_L)(C_{max} - K_I) + (1-\beta)\alpha z$.