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Working Paper

Rules, Discretion, Corruption, and Efficient Sole-Sourcing in Procurement

CESifo Working Paper, No. 11489

Provided in Cooperation with:

Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

Suggested Citation: Amegashie, J. Atsu (2024) : Rules, Discretion, Corruption, and Efficient Sole-Sourcing in Procurement, CESifo Working Paper, No. 11489, CESifo GmbH, Munich

This Version is available at:

<https://hdl.handle.net/10419/308385>

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Impressum:

CESifo Working Papers

ISSN 2364-1428 (electronic version)

Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH

The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute

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Editor: Clemens Fuest

<https://www.cesifo.org/en/wp>

An electronic version of the paper may be downloaded

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Abstract

I study a model of procurement with moral hazard and adverse selection. The procurer is either corrupt or honest and can choose between sole-sourcing and competitive tender. I compare two procurement regulations: no sole-sourcing is allowed (rigid regulation) and sole-sourcing is allowed in an emergency (flexible regulation). Sole-sourcing in an emergency is efficient. Whether there is an emergency that justifies sole-sourcing is the procurer's private information. A regulator may fire the procurer depending on his belief that the procurer is corrupt. I find the counterintuitive result that if the gain to corruption is big, a flexible procurement regulation may be better than a rigid procurement regulation. If the gain to corruption is sufficiently small, the flexible regulation may be worse or better than the rigid regulation. Interestingly, although the inefficient choice of sole-sourcing is not always penalized, there exists a perfect Bayesian Nash equilibrium in which a corrupt procurer could be given discretion and incentivized to use sole-sourcing efficiently but without an explicit monetary incentive contract. In this case, the flexible regulation is better than the rigid regulation. The results are driven by three sources of inefficiency that are discussed in the paper.

JEL-Codes: D730, D780.

Keywords: competitive tender, procurement, private information, sole sourcing.

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October 20, 2024

1. Introduction

Public procurement is a significant source of expenditure in many countries, accounting for about 15 percent of global gross domestic product (GDP), estimated at US\$11 trillion annually (Fazekas and Blum, 2021). It is governed by national and international procurement laws. These laws give discretionary power to bureaucrats and politicians in the procurement of public services and projects. However, this power can be abused and misused for corrupt gains or parochial interests. As a result, discretion is sometimes replaced with rigid rules.

In economics, the seminal and formal analysis of rules versus discretion was Kydland and Prescott (1977). They found that rules, relative to discretion, resulted in higher social welfare. Barro and Gordon (1983a, 1983b) studied the relative optimality of rules versus discretion in a game-theoretic monetary model in which a central banker with discretionary power has the perverse (time-inconsistent) incentive to produce too much inflation in order to reduce unemployment. They also found that rules could be welfare-improving.

The vibrant literature that ensued provided the intellectual foundation for the independence of central banks, monetary rules like the Taylor rule, inflation targeting, Friedman's k-percent rule, statutory limits on loans from a central bank to its government, etc (e.g., Harris and Tavlas, 2022). Relatedly, there are fiscal rules like statutory earmarked taxes, debt limits (as in the USA), balanced budget rules, limits on budget deficits as a percentage of GDP, etc.

In the paper, I examine rules versus discretion in public procurement. Competitive tender is desirable in procurement because, among others, it usually results in the buyer getting a good price for a service. But in cases where it is not feasible or optimal, non-competitive tendering

like sole-sourcing is permitted. Because sole-sourcing is more prone to corruption, procurement regulations in many countries (e.g., Canada, USA, Ghana, Japan, etc) state that sole-sourcing must be used sparingly and justifications must be provided. Examples of justifications for sole-sourcing are emergencies; the goods, works or services are only available from a particular supplier or contractor; goods, equipment, technology or services were previously procured from the supplier or contractor and additional supplies need to be procured from the same supplier or contractor because of standardisation or there is a need for compatibility with existing goods, equipment, technology or services. For example, according to the federal government of Canada:

*“One of the fundamental principles of federal contracting is openness and the practice of providing potential suppliers with opportunities to submit bids for government contracts. For this reason, **when departments choose a non-competitive procurement strategy, it must be fully justified and recorded.** ... the Government Contracts Regulations require the contracting authority to solicit bids. However, for procurements not subject to the trade agreements, the GCRs allow for exceptions to competition where: **The need is a pressing emergency where delay would be injurious to the public interest.**”¹ (Bold font mine).*

However, it seems that these regulations are not strictly adhered to. For example, a report² released in March 2024 by Canada's procurement ombudsman, Alexander Jeglic, examined government contracts awarded to the consulting firm, McKinsey, between April 2011 and March 2023. Jeglic found that McKinsey had been awarded dozens of contracts amounting to \$CAD 117 million during that twelve-year period, most of the contracts were sole-sourced, and Public Services and Procurement Canada (PSPC) failed to provide proper justification for the sole-

¹Source: <https://www.canada.ca/en/treasury-board-secretariat/services/policy-notice/2007-4.html>

²“Procurement Practice Review of Contracts Awarded to McKinsey & Company”, Office of the Procurement Ombud, Federal Government of Canada, March 2024: <https://opo-boa.gc.ca/paapp-prorev/2024/epa-ppr-03-2024-01-eng.html>

sourced contracts.³ In March 2024, the government of Canada established the Office of Supplier Integrity and Compliance (OSIC) program to strengthen the oversight of federal procurement processes.⁴

Using data for procurement contracts in the information technology and telecommunications sectors from 2004 to 2015, Kang and Miller (2022) examined 17,123 US federal government contracts. They found that more than two-thirds of the contracts were awarded without using full and open competition. In 5% of these cases, the justification for using sole-sourcing or restricted bidding was "urgency".⁵

It is important to note that sole-sourcing or the violation of procurement regulations does not necessarily imply corruption, fraud, or expensive contracts (relative to competitive tender). For example, in a large database for public works in Italy, where works with a value above a given threshold have to be awarded through an open auction and works below this threshold can be awarded through a restricted auction, and the procurer had some discretion over who (not) to invite to bid, Coviello et al. (2018) found that discretion increased the probability that the same firm repeatedly won contracts but this did not deteriorate (and may improve) the procurement outcomes. Carril and Duggan (2020) also found, using data on US Department of Defense contract awards, that sole-sourcing did not increase the cost of procurement (see also, Caril,

³For permissible justifications of sole-sourcing in US Federal procurement, see Kang and Miller (2022). The provision of a justification for sole-sourcing procurement is also required in many other countries. For example, as in the case of Canada, section 40 of Ghana's Public Procurement Act (Act 663, 2003) provides that "A procurer may engage in single-source procurement ... where there is an **urgent need** for the goods, works or services and engaging in tender proceedings or any other method of procurement is impractical due to **unforeseeable circumstances giving rise to the urgency** which is not the result of dilatory conduct on the part of the procurer." Bold font mine.

⁴In August 2024, a public servant in Canada pled guilty to criminal breach of trust for directing 72 sole-source contracts to a company that he fully owned. (<https://archive.ph/2024.09.06-044003/https://www.theglobeandmail.com/politics/article-former-federal-public-servant-pleads-guilty-to-awarding-72-sole-source/>).

⁵For an analysis of the role of emergencies in the choice of procurement methods, see Bandiera, Bosio, and Spagnolo (2021).

2021). However, too many violations of procurement regulations or instances of sole-sourcing are indications of a dysfunctional and/or corrupt system⁶ of procurement, especially in countries with weak public sector capacity as found in Bosio et al. (2022). For example, using almost 50,000 public procurement operations in Paraguay, covering the period 2004 – 2007, Auriol et al. (2016) concluded that, in Paraguay, the main channel for corruption in procurement was the *systematic* use of sole-sourcing.

I study a simple two-period model of procurement with moral hazard and adverse selection which is based on the political agency models of Barro (1973) and Ferejohn (1986). A procurer is either corrupt or honest and can choose between sole-sourcing (restricted bidding) and competitive tender (less restricted bidding). Under a rigid procurement regulation, sole-sourcing is not allowed in any circumstances. Under a flexible procurement regulation, sole-sourcing is allowed if there is an emergency.⁷ Sole-sourcing in an emergency is efficient. Whether there is an emergency that justifies sole-sourcing is the procurer's private information (i.e., not known by the regulator of the procurer). The regulator may punish the procurer if he has a strong belief that there was corruption in the procurement process.

In equilibrium, I find that whether a rigid procurement regulation is better than a flexible procurement regulation depends on the balance of three sources of inefficiency: competitive tender inefficiency (i.e., using competitive tender in an emergency); sole-sourcing inefficiency (i.e., using sole-sourcing in a non-emergency); and (c) retention inefficiency (i.e., retaining or not firing a corrupt procurer).

⁶In a study, the OECD (2016) found that 10% to 30% of the costs of publicly funded construction projects are due to corruption and incompetence in procurement.

⁷Bandiera, Bosio, and Spagnolo (2021) is an edited book that examines the interaction of rules, discretion, and emergencies in procurement.

I find the counterintuitive result that if the gain to corruption is big, a rigid procurement regulation (sole-sourcing is not allowed) may be inferior to a flexible procurement regulation (e.g., sole-sourcing is allowed in some circumstances). Discretion is better than rules. This is because when the gain to corruption is big, a rigid procurement regulation cannot deter a corrupt procurer from inefficiently using sole-sourcing (i.e., when it is not socially desirable)⁸ and it does not allow an honest procurer to efficiently use sole-sourcing. The advantage of a rigid regulation is that honest procurers are able to separate themselves from corrupt procurers.

If the gain to corruption is sufficiently small, a flexible procurement regulation may be better or worse than a rigid regulation. To be specific, if the gain to corruption is sufficiently small, this paper shows that there exists an equilibrium in which a corrupt procurer can be given discretion and also incentivized to choose sole-sourcing efficiently, although the inefficient choice of sole-sourcing is not always penalized and this outcome is *not* achieved by using a sophisticated contract or any explicit monetary incentive contract. It is achieved by optimally firing the procurer. In this case, discretion is better than rules.

To the best of my knowledge, this is the first paper to study the optimal *frequency* of sole-sourcing and finds that a procurer can be incentivized to choose sole-sourcing efficiently. This is consistent with Kelman (1990a, 1990b) and Banfield (1975), who argued that some discretion combined with *ex post performance checks* is essential to good public management, even at the cost of a small loss in accountability. In my model, there is some loss of accountability because, by mimicking an honest procurer, a corrupt procurer may not be fired.

⁸One may argue that the fine or punishment for using sole-sourcing can be set high enough to deter corruption. In the economics literature on crime and punishment, it is well known that maximal fines or punishment may not be feasible for a variety of reasons (e.g., Andreoni, 1991; Boadway et al., 1996). In addition, a legislature may not enact laws that impose maximal fines or a judiciary, with discretion, may also not impose maximal fines, even if the executive arm of government wants huge fines or very severe punishment. In my model, the executive (principal) cannot prove in a court of law that the procurer is corrupt but can fire or reassign the procurer.

1.1 Relation to previous literature: additional discussion

The standard approach in the literature on public procurement and auctions assumes that the procurer acts optimally in the public interest (e.g., the maximization of social welfare; to break bidding cartels in order to reduce the cost of procurement; award the contract to the most efficient company, etc). Papers like Auriol (2006), Bandeira, Prat, and Valletti (2009), Bosio et al. (2022), Carril (2022), Decarolis et al. (2017), Compte et al. (2005), Coviello, Guglielmo, and Spagnolo (2018), Decarolis et al. (2023), and Bajari et al. (2008) depart from this assumption by looking at procurement entities that may act in their selfish and parochial interests.⁹

My paper follows the aforementioned papers by assuming that the procurer may be corrupt but differs from them in the sense that the procurer is punished for violating procurement regulations and the probability of punishment is endogenous. Bosio et al. (2022) consider the punishment of the procurer. But, in their model, the probability of punishment is exogenous because the regulator's behavior is not explicitly analyzed and it is not a multi-period model.

Auriol (2006) studies a model in which a corrupt procurer has private information about the number of firms (i.e., the degree of competition) that can supply a service. The procurer must choose the principal's preferred method (i.e., chooses sole-sourcing or competitive tender). So, the procurer cannot openly violate the procurement regulation. But the principal's choice of procurement method depends on whether it is necessary to know the procurer's private information and, in her single-period model, a corrupt procurer is not punished for being corrupt even if the principal knows that the procurer is corrupt. Auriol (2006) found that if competitive tender or sole-sourcing is optimal, *independently* of the procurer's private information, then the

⁹For a survey of the literature on inefficiencies and corruption in public procurement, see Fazekas and Blum (2021).

principal does not have to incentivize the procurer to disclose its private information and the procurer obeys the principal's optimal procurement method. Auriol (2006) also found that, in some cases, it is optimal for the principal to pay the procurer to disclose its private information but the procurer, with a positive probability (less than 100%) hides its information and sole-sourcing is the procurement method used, although the procurer's private information is that competitive tender is optimal. My model is different in many respects. It has multiple periods; the procurer can violate the principal's preferred procurement method; the procurer's private information is never irrelevant; the principal may fire the procurer on suspicion of being corrupt and the principal (regulator) will definitely fire the procurer if the principal is certain that the procurer is corrupt. In my model, a corrupt procurer can be incentivized to choose the optimal frequency of sole-sourcing and this result is not achieved by choosing an optimal incentive payment to the procurer. Finally, the economic intuition for my results is entirely different.

Carril (2022) studies a one-period model with moral hazard and adverse selection. In his model, when there is rigid regulation, the procurer's private information is revealed to the regulator but it is not revealed when there is flexible regulation (discretion). In my model, the procurer's private information is not revealed to the regulator under any circumstance. In Carril (2022), rigid regulation results in red-tape costs but it eliminates wasteful spending by a corrupt procurer. In my model, these red-tape costs have an effect similar to the cost that stems from the requirement that, under the rigid procurement regulation, the procurer should use competitive tender in an emergency. But, in my model, a rigid procurement rule does not necessarily induce a procurer to exercise restraint. In Carril (2022), there is no firing of the procurer and so it is *not* used as an incentive tool. Also, he does not focus on sole-sourcing and the optimal frequency of sole-sourcing. Estache and Foucart (2018) study a model of corruption in public procurement

with auditors and courts. Their model is different because they do not consider procurement regulations (e.g., sole-sourcing versus competitive tender). In their model, the auditors and courts (the regulators) get exogenous signals about the cost of the project (i.e., high cost and low cost) and the character of the procurer (i.e., corrupt or honest). In my model, the regulator infers the character of the procurer based on Bayesian updating.

In their empirical work on government procurement contracts in Italy, Decarolis et al. (2023) found that more discretion was a double-edge sword in the sense it leads to greater efficiency but also more opportunities for corruption. Based on US Defense procurement, Carril et al. (2022) concluded that discretion is welfare-enhancing when the transaction is complex while strict regulation is better when the transaction is relatively simple. Bruges et al. (2024), Baltrunaite et al. (2021), and Szucs (2024) found that sole-sourcing or restricted tender increased prices and resulted in the selection of less productive firms (politically connected firms) in Ecuador, Italy, and Hungary *respectively*. In China, Hang and Zahn (2023) found that tighter regulation of procurement reduced the extent of resource misallocation in industries that rely more on government procurement while Carril (2022), found in the case of the USA, that tighter regulation reduced welfare.

Using Italian procurement data, Bandeira, Prat, and Valletti (2009) found that corruption increased the contract price by 11% while inefficiency due to bureaucratic red tape increased the price by 83%. In the case of the Czech Republic, Baranek and Titl (2024) found that favoritism toward politically connected firms increased the price of procurement contracts but this increase was mitigated by additional oversight from a higher level of the government, co-funded by the European Union. Decarolis et al. (2023) also found a similar result in the case of public procurement in Italy.

As noted above, whether rules are better than discretion in procurement depends on industry and country-specific circumstances. Based on a dataset of public procurement laws, practice, and outcomes in 187 countries, Bosio et al. (2022) concluded that stricter laws (regulations) lead to positive outcomes in poorer and low public sector capacity countries but have a negative effect in richer and high public sector capacity countries. They also found that bureaucrats in countries with high public sector capacity have relatively high levels of integrity and quality. Given this high level of integrity or self-regulation, reducing their discretionary power through stricter regulations reduces social welfare.

The paper is organized as follows. In the next section, I present a game-theoretic two-period model of procurement regulations and find its equilibria. Sections 3 and 4 discuss the results. Section 5 concludes the paper.

2. Sole-sourcing versus competitive tender

Consider a two-period model of a country, where the periods are labelled 1 and 2. In both periods, the country's (risk-neutral) procurer can procure a service (e.g., construction of a road, hospital, electricity, medical supplies, etc) from at least *two* identical firms. The procurer has a discount factor of $\delta \in (0,1)$.

The procurer can achieve its goal via sole-sourcing (denoted by s) or competitive tender (denoted by c). Under competitive tender, the cost of the project is T and under sole-sourcing, the cost is S , where $S > T > 0$. In general (but not always), competitive tender, relative to sole-

sourcing, reduces the cost of procured services/projects as a result of the firms (suppliers) underbidding each other in competitive tender (e.g., Carril et al., 2022; Szucs, 2024).¹⁰

The country can opt for one of two procurement regulations: (a) a rigid competitive tender (RCT) regulation, under which the service has to be procured via a competitive tender in all circumstances (rules). So, sole-sourcing is not allowed under any circumstances, and (b) a flexible competitive tender regulation (FCT), under which the service has to be procured via competitive tender but, *as is the case in the procurement laws of most countries*, there is an exception where sole-sourcing is allowed if there is an emergency (i.e., the procurer has discretion).

Denote an emergency by e and non-emergency by n . Let B_{ij} be the social benefit of the project or service when procurement method $j \in \{s, c\}$ is used in state $i \in \{e, n\}$ and assume that $B_{ij} - S > 0$, for all i and j . Suppose that, under the FCT regulation, the reason sole-sourcing is allowed in emergency is because $B_{es} - S > B_{ec} - T$. That is, in an emergency, sole-sourcing gives a higher net social benefit than competitive tender. Given $S > T$, this implies that $B_{es} > B_{ec}$. This is because in, an emergency, competitive tender (relative to sole-sourcing) results in a socially costly delay which gives a smaller social benefit.¹¹

¹⁰The monetary costs of organizing a competitive tender are higher than the organizational costs for sole-sourcing. But the gains of competitive bidding usually outweigh the associated organizational costs, especially for large projects. Auriol (2006) found that competitive tender is more valuable than sole-sourcing when the number of bidders is large and when the cost of organizing a competitive tender is low. It is not surprising that procurement laws stipulate that competitive tender should be the norm rather than the exception and allow sole-sourcing in some circumstances.

¹¹For example, as stated in section 1, the procurement law of the Federal government of Canada allows sole sourcing if there is a pressing emergency such that a delay caused by competitive tender “... *would be injurious to the public interest*.” According to Auriol (2006, footnote 9): “It takes **time** and money to organize open tenders. First the purchasing entity has to specify its need in writing. Next it has to advertise tender information in official gazettes, newspapers, bulletin board or bidding information journals. If the firms that get the information are interested, they have to work out detailed offers. The purchasing entity has to review and evaluate the offers. Finally, it has to write a report to justify its choice.” Bold font mine. For reasons why sole-sourcing or fewer bidders may be better than more bidders, see, for example, Bajari et al. (2008), Calzolari and Spagnolo (2020), Manelli and Vincent (1995), Spulberg (1990), Carril (2022), and Kang Miller (2022).

In the same vein, $B_{nc} > B_{ec}$. But $B_{es} = B_{nc}$. That is, using competitive tender when there is no emergency and using sole-sourcing when there is an emergency give the same social benefit. This is because, given that the firms are identical, competitive tender does not result in technically superior firms relative to sole-sourcing. The difference in the cost of the project between sole-sourcing and competitive tender has nothing to do with differences in the firms' costs of production. The difference stems from the different abilities to mark up prices over costs under sole-sourcing relative to competitive tender.¹² In general, I assume that the only time that social benefit is lower is when competitive tender is used in an emergency (i.e., B_{ec} is the smallest social benefit). In all other cases, social benefits are the same.

The procurer is either corrupt/dishonest (D) or honest (H), where $prob(H) = q \in (0,1)$. A procurer's type is its private information. Whether there is an emergency, which justifies sole-sourcing, is also the procurer's private information. An emergency occurs with probability, $p \in (0,1)$. Under sole-sourcing, a corrupt procurer gets (through bribery) a payment of $K > 0$ but gets $\theta \in (0, K)$ under competitive tender.

There is a regulator¹³ who has the power to fire and appoint the CEO of the procurement entity (i.e., the *procurer*), the final decision-maker. The procurer is fired if the regulator has sufficient belief that there was corruption in the procurement process. Thus, the procurer could be fired on suspicion of violating the procurement regulation. This need not be taken literally. Firing could be interpreted as the reassignment of the procurer to positions with very limited opportunities

¹²Suppose $F > 0$ is the cost of delivering the service or good. Then, under sole-sourcing, the firm that is awarded the contract gets $S - K - F > 0$ and, under competitive tender, the successful firm gets $T - \theta - F > 0$.

¹³Examples of such regulators are the Contractor-General of Jamaica; Office of the Procurement Ombud in Canada; the Government Accountability Office for the U.S. federal government; and the National Audit Office in the United Kingdom.

for corruption.¹⁴ It is important to note that the regulator's decision to fire the procurer is not *merely* because he believes that the procurer received a bribe in period 1. It is because a procurer who received a bribe (was corrupt) in period 1 will, as argued below, deliver a smaller social benefit in period 2. Bribery *per se* is not punished.¹⁵

The regulator does not observe the social benefits (e.g., B_{es} and B_{ec}) because he does not observe an emergency or non-emergency.¹⁶ So, he does not condition the decision to fire or not fire on the social benefits. If the procurer is fired, he is replaced in period 2 with another person from an *identical* population (i.e., a population with $\text{prob}(H) = q$).

Recall that, in period 2, a procurer is in a position to procure the same service under the same conditions. An honest procurer follows the procurement regulation in period 2 and acts conscientiously. In contrast, I assume that, in period 2, a corrupt procurer --- with no risk of being punished --- awards the contract via sole-sourcing, gets a bribe of K , but does not properly supervise the work, resulting in a (net) social benefit of zero.¹⁷ However, I assume that a corrupt procurer will supervise the work and act diligently in period 1 even if he knows that he will be fired. This is because there is enough time to hold him accountable for any shoddy work done in period 1. When shoddy work is done in period 2, there is not enough time to hold him accountable. Literally, the 'game' ends.

¹⁴Periodic rotation or reassignment as solution to corruption is common (see, for example, Klitgaard, 1988).

¹⁵A reason is that bribery is not observable.

¹⁶This is similar to an assumption in Besley and Prat (2006) and Coate and Morris (1995). In Coate and Morris (1995), a politician can make disguised transfers to special interests through his choice of a public project. Coate and Morris (1995) assume that a representative citizen (who is the principal like the regulator in my model) does not know whether the project is socially beneficial or not because the social benefit of the project is a random variable, which could be high or low. Similarly, Besley and Prat (2006, p. 723) stated that "To make the problem interesting, we suppose that voters do not observe their payoffs at the time of the re-election decision. This is reasonable if some of the incumbent's policies have long-term consequences such as ... investing in infrastructure."

¹⁷Zero is a normalization. What matters is that, in period 2, a corrupt procurer delivers a smaller social benefit than an honest procurer.

Comments on the assumption that an emergency is the procurer's private

information: First, a corrupt procurer may be able to “manufacture” an emergency (i.e., self-created emergency).¹⁸ Second, an emergency need not be a publicly observable event like a natural disaster, a pandemic, etc. An emergency could also be the result of the failure of equipment or infrastructure.¹⁹ Second, as stated in section 1, there are other reasons for allowing sole-sourcing or restricted tenders. *The analysis in this paper will go through if any of these reasons, instead of an emergency, is used as the justification for sole-sourcing.* Sole-sourcing or flexible procurement regulations are also allowed or efficient if the goods or services to be procured are complex.²⁰ The complexity of the goods or services can also be the procurer's private information because the procurer may have superior technical knowledge. As in Auriol (2006), the procurer could also have private information about how competitive the market for the good or service is. If sole-sourcing is allowed for contract amounts below a certain threshold, the procurer could manipulate the contract amount through, for example, dubious paper work.²¹ Thus, the contract amount, the complexity of the service, the competitiveness of the market, etc can be the procurer's private information just like the occurrence of an emergency. Finally, one

¹⁸What is an emergency as a justification for sole-sourcing is defined in various procurement laws. The common definition is that an emergency must stem from unforeseen circumstances. The World Trade Organization's “Agreement on Government Procurement” says that sole-sourcing is permitted if as a result of “... extreme urgency brought about by events unforeseeable by the procuring entity, the goods or services could not be obtained in time using open tendering ...” (https://www.wto.org/english/docs_e/legal_e/rev-gpr-94_01_e.htm#articleXIII). In practice, the “emergency” justification has been the subject of disputes resulting in resolutions by courts. Examples are (a) *Fairview Valley Fire, Inc. v. California Department of Forestry*, California (USA), 2015; (b) *ALS Canada Ltd v. Statistics Canada*, Canada, 2018; and (c) *Nationwide Gritting Services Ltd v. The Scottish Ministers*, Scotland (UK), 2014.

¹⁹For example, this is stated in New Zealand's procurement regulations (<https://www.procurement.govt.nz/assets/procurement-property/documents/guide-emergency-procurement.pdf>) According to the USA's Federal Emergency Management Agency (FEMA). “Exigency or emergency circumstances will vary for each incident, making it difficult to determine in advance or assign a particular time frame when noncompetitive procurements may be warranted.” (<https://www.fema.gov/press-release/20230906/procurement-under-grants-under-exigent-or-emergency-circumstances>).

²⁰For example, see Carril et al. (2022).

²¹Palguta and Pertold (2017) and Coviello et al. (2024) present evidence of the manipulation of procurement values below regulatory thresholds in order to avoid regulation.

may think of the procurement environment as a second-best situation with informational constraints and imperfect checks and balances. For example, using Chilean data, Gerardino et al. (2024) found that a higher probability of audits of competitive tenders (auctions) resulted in a shift away from transparent auctions (competitive tender) towards less competitive direct contracting (e.g., sole sourcing). Relative to comparable direct contracts, they found that auctions were subjected to more than twice as many checks, led to twice as many detected infractions, and were twice as likely to trigger formal follow-up investigations. As they noted, the ability of the procurers to shift away from transparent auctions towards less competitive direct contracting arises in second-best environments where audits are designed to maximize the detection of infractions but agents have some discretion over the choice of procedure.

2.1 Equilibrium analysis

I look for a perfect Bayesian Nash equilibrium. In this equilibrium, (a) the regulator, in period 1, optimally responds by firing or retaining²² the procurer based on the regulator's belief about whether the procurer's choice of sole-sourcing or competitive tender implies that he is sufficiently corrupt, (b) given the regulator's strategy, the procurer optimally responds by choosing sole-sourcing or competitive tender, and (c) whenever possible, the regulator's beliefs are derived from the procurer's strategies using Bayes' rule.

The regulator will fire the procurer if his posterior belief that the procurer is corrupt is greater than his prior belief (i.e., $1 - q$).²³ *I assume that if the regulator observes competitive tender and is indifferent between retaining and firing the procurer, he retains the procurer.* This

²²Strictly speaking, the regulator only makes this choice in period 1 because the game ends in period 2, so the regulator cannot fire the procurer in period 2.

²³Banks and Sundaram (1998), Besley and Smart (2007) and Coate and Morris (1995) used the same or similar rule but in different models.

tie-breaking assumption is consistent with the bias in almost all public procurement regulations in the sense that competitive tender is stated as the norm while sole-sourcing and other restricted tenders are stated as exceptions.²⁴

An honest procurer is law-abiding and thus follows the procurement regulations under the RCT and FCT regulations. Under the FCT regulation, he chooses sole-sourcing or competitive tender *after* he knows whether there is an emergency or non-emergency. In contrast, a corrupt procurer is opportunistic and may choose to use sole-sourcing or competitive tender before or after he knows that there is an emergency or non-emergency.²⁵

Start from period 2. If an honest procurer awards the contract in period 2, the expected (net) social benefit is $\Delta_{RCT} = (1 - p)(B_{nc} - T) + p(B_{ec} - T)$ under the RCT regulation, and it is $\Delta_{FCT} = (1 - p)(B_{nc} - T) + p(B_{es} - S)$ under the FCT regulation. Note that $\Delta_{FCT} > \Delta_{RCT}$ because $B_{es} - S > B_{ec} - T$. In period 2, a corrupt procurer will use sole-sourcing and get K , regardless of the procurement regulation,²⁶ because he cannot be punished in period 2. Social welfare is zero.

²⁴For example, in the case of the USA, Kang and Miller (2022, p. 1499) observed that “*Full and open competition* is the default acquisition process, and federal regulations specify the circumstances under which a procurement agency is allowed to limit competition.”

²⁵In political agency models with two states (e.g., Besley and Coate (2007) and Coate and Morris (1995)), the “bad” type of the politician (or agent) can pretend to be a “good” type and gain in only one favorable state (e.g., low-cost state) but *not* in the other state (e.g., an unfavorable high-cost state). In my model, the bad type can pretend to be the good type and *equally* gain in *both* states (i.e., emergency and non-emergency). Therefore, he can make his decision before or after the state is revealed.

²⁶One may argue that under a rigid procurement regulation, firms that were excluded from process could seek redress in court. This would then deter any firm from entering into a sole-sourcing agreement with the procurer. In countries with inefficient judicial systems (e.g., long delays in the resolution of cases), this may not deter the favored firm. The favored may still participate in sole-sourcing so long as there is non-zero probability that the aggrieved firms will lose in court. In fact, Bosio et al. (2022) found that *procurement laws tend to be stricter than practice* in countries with low public sector capacity.

Now consider period 1.

Case 1: *The gain to corruption is large*

Suppose $K \geq \theta + \delta K$, which can be rewritten as $K \geq \theta/(1 - \delta)$. If a corrupt procurer uses sole-sourcing and is fired, his payoff is K . If he uses competitive tender and is *not* fired, his payoff is $\theta + \delta K$. Then, under the RCT regulation, a corrupt procurer will use sole-sourcing, *regardless of the state* (i.e., emergency or no emergency), given that $K \geq \theta/(1 - \delta)$. He will be fired because --- given that an honest procurer does not violate the RCT regulation --- the regulator can infer *with certainty* that he is corrupt.²⁷

Consider the FCT regulation. Given $K \geq \theta/(1 - \delta)$, a corrupt procurer will again use sole-sourcing, regardless of the state, even if he will be fired. Using sole-sourcing is a weakly dominant strategy for a corrupt procurer because K is sufficiently high (i.e., $K \geq \theta/(1 - \delta)$).

Given that an honest procurer will follow the FCT regulation, we get $\text{prob}(D|s) =$

$\frac{(1)(1-q)}{(1)(1-q) + pq} > 1 - q$. Therefore, a procurer who uses sole-sourcing will be fired. Note that

$\text{prob}(H|c) = 1$.

We get the following proposition:

Proposition 1: *Suppose $K \geq \theta/(1 - \delta)$. There exists a perfect Bayesian Nash equilibrium in which, in each period, an honest procurer always follows the procurement regulation. Under the rigid procurement rule, he is not fired (in period 1). Under flexible rule, he is not fired if he uses*

²⁷One may argue that, under the RCT regulation, a corrupt procurer may use sole-sourcing because there was an emergency and using sole-sourcing gives a bigger social benefit than using competitive tender. Thus, the regulator should not fire the procurer because he acted in the public interest. The argument is weak for the following reasons: (a) I assume that the corrupt procurer is not socially-minded to act in the public interest or the regulator does not believe that the procurer is socially minded, and/or (b) a promise by the regulator that he may not fire a procurer who acted in the public interest even if the regulator believes that the procurer is corrupt is time-inconsistent because, *after* the procurer has acted in period 1, the regulator's optimal response is to fire him if he believes that the procurer is corrupt.

competitive tender but is fired if he uses sole-sourcing. In each period, a corrupt procurer uses sole-sourcing, regardless of whether there is an emergency and regardless of whether the procurement regulation is rigid or flexible, and is fired in period 1.

Remark: It is apparently paradoxical that in the equilibrium in proposition 1, the regulator – when he observes sole-sourcing -- fires the procurer with certainty under the flexible procurement regulation, regardless of the procurer’s type, although sole-sourcing is allowed under the flexible regulation. Some comments are in order. First, relative to the rigid regulation, the flexible procurement regulation is in place in order to get the social benefit of an honest procurer’s efficient use of sole-sourcing in period 1. Second, sole-sourcing is not being discouraged because an honest procurer will still use sole sourcing even if he will be fired. Third, firing the procurer, on the basis of the belief that he is corrupt, is intended to get an honest procurer in period 2 who will use sole-sourcing if there is an emergency. Fourth, this equilibrium (in proposition 1) is consistent with public outcry against sole-sourcing in countries where it is strongly believed that sole-sourcing is abused for corrupt purposes.²⁸ In the equilibrium in proposition 1, such a strong belief is not because of a high percentage of corrupt officials (i.e., q is small). Instead, there is a strong belief of corruption because the gain to corruption is too big (i.e., $K \geq \theta/(1 - \delta)$), resulting in a corrupt procurer choosing sole-sourcing, regardless of the state. Thus, when the regulator observes sole-sourcing, his posterior belief that the procurer is corrupt is stronger than his *prior* belief (i.e., $1 - q$).

Given the equilibrium in proposition 1, the expected social welfare, under RCT, is:

²⁸As mentioned in section 1, Auriol et al. (2016) concluded that, in Paraguay, the main channel for corruption in procurement was the *systematic* use of sole-sourcing.

$$SW_{RCT} = q\{p(B_{ec} - T) + (1 - p)(B_{nc} - T) + \Delta_{RCT}\} + (1 - q)\{p(B_{es} - S) + (1 - p)(B_{ns} - S) + q\Delta_{RCT}\}, \quad (1)$$

and the expected social welfare, under FCT, is:

$$SW_{FCT} = q\{p(B_{es} - S + q\Delta_{FCT}) + (1 - p)(B_{nc} - T + \Delta_{FCT})\} + (1 - q)\{p(B_{es} - S + q\Delta_{FCT}) + (1 - p)(B_{ns} - S + q\Delta_{FCT})\}. \quad (2)$$

This simplifies to:

$$SW_{FCT} = q\{p(B_{es} - S) + (1 - p)(B_{nc} - T) + (1 - (1 - q)p)\Delta_{FCT}\} + (1 - q)\{p(B_{es} - S) + (1 - p)(B_{ns} - S) + q\Delta_{FCT}\}. \quad (2a)$$

Then, noting that $\Delta_{FCT} - \Delta_{RCT} = p[(B_{es} - S) - (B_{ec} - T)]$, we get

$$SW_{FCT} - SW_{RCT} = (2 - p)qp\{(B_{es} - T) - (B_{ec} - T)\} + q\{[1 - (1 - q)p]\Delta_{FCT} - \Delta_{RCT}\}. \quad (2c)$$

Given that $B_{es} - S > B_{ec} - T$ and so $\Delta_{FCT} > \Delta_{RCT}$, a sufficient condition for $SW_{FCT} > SW_{RCT}$ is that the second term of (2c) is positive. That is, $[1 - (1 - q)p]\Delta_{FCT} > \Delta_{RCT}$. This leads to the following result:

Corollary 1: *Suppose $K \geq \theta/(1 - \delta)$ and $[1 - (1 - q)p]\Delta_{FCT} > \Delta_{RCT}$. Then the rigid procurement regulation gives a lower social welfare than the flexible procurement regulation. Discretion is better than rules.*

Corollary 1 is counterintuitive because it implies that, *when the gains to corruption is high*, a flexible regulation may be better than a rigid regulation. But note that

$[1 - (1 - q)p]\Delta_{FCT} > \Delta_{RCT}$ will hold if q is sufficiently big. Thus, the flexible regulation gives a higher social welfare than the rigid regulation if the percentage of honest officials is high.²⁹ This is intuitive because it is an honest procurer who will definitely use sole-sourcing when it is efficient (i.e., in an emergency). It is important to note that $[1 - (1 - q)p]\Delta_{FCT} > \Delta_{RCT}$ is a sufficient but not a necessary condition for the flexible regulation to dominate the rigid regulation. In general, the flexible regulation may be better because when the gain to corruption is big because a rigid procurement regulation cannot deter a corrupt procurer from inefficiently using sole-sourcing and yet it does not allow an honest procurer to efficiently use sole-sourcing. In this model, the disadvantage of the flexible procurement regulation is that the regulator fires honest procurers with a high probability than the corresponding probability under a rigid regulation. Under a rigid regulation, honest procurers are able to separate themselves from corrupt procurers.

Case 2: *The gain to corruption is small*

Suppose $K < \theta + \delta K$ or $(1 - \delta)K < \theta$. Consider the RCT regulation. If the regulator observes sole-sourcing, he will fire the procurer because, given the RCT regulation, an honest procurer will *not* use sole-sourcing. Given $(1 - \delta)K < \theta$ and the RCT regulation, a corrupt procurer will use competitive tender in period 1, regardless of the state, because the bribe, K , from sole-sourcing is small, and he will be fired for using sole-sourcing but he will not be fired for using competitive tender because the regulator's posterior belief, given that both types use

²⁹This is consistent with a result in Bosio et al. (2022).

only competitive tender, is $\text{prob}(D|c) = 1 - q$.³⁰ Therefore, given $(1 - \delta)K < \theta$, both types of the procurer will use competitive tender in period 1 under the RCT regulation, regardless of whether there is an emergency or non-emergency.

Therefore, if there is no emergency, social welfare is $B_{nc} - T$. If there is an emergency social welfare is $B_{ec} - T$. It follows, that given $(1 - \delta)K < \theta$, expected social welfare under the RCT regulation is:

$$\widehat{SW}_{RCT} = (1 - p)(B_{nc} - T) + p(B_{ec} - T) + q\Delta_{RCT}. \quad (3)$$

After characterizing the equilibrium under the FCT regulation (see **appendix A**), I can state the following proposition:

Proposition 2: *Suppose $\theta < K < \theta/(1 - \delta)$. There exists a perfect Bayesian Nash equilibrium in which an honest procurer uses competitive tender in both periods under the rigid procurement regulation, regardless of whether there is an emergency, and is not fired. Under the rigid procurement regulation, a corrupt procurer uses competitive tender in period 1, regardless of whether there is an emergency, and is not fired. Under the flexible procurement regulation, an honest procurer follows the procurement regulations but a corrupt procurer randomizes between sole-sourcing and competitive tender in period 1, where he chooses sole sourcing with probability, p (i.e., the probability that there is an emergency) and chooses competitor tender with probability, $1 - p$. If the regulator observes sole-sourcing, he randomizes between firing and retaining the procurer, such that he fires the procurer with probability $(1 - \hat{\pi})$ in period 1, where*

³⁰The regulator's posterior belief that the *current* procurer is corrupt is the same as his prior belief that a *new* procurer is corrupt. The current procurer is as good as a new procurer. Recall that I have assumed that, in this case of indifference, the procurer is not fired.

$\hat{\pi} = \frac{\theta - (1-\delta)K}{\delta K} \in (0,1)$. The regulator retains the procurer when he observes competitive tender.

The regulator's beliefs are $\text{prob}(D|c) = \text{prob}(D|s) = 1 - q$.

Under the FCT regulation, an honest procurer uses competitive tender only in a non-emergency which occurs with probability, $(1 - p)$. Therefore, if there is *no* emergency and the procurer is honest, social welfare is $B_{nc} - T$ and this occurs with probability, $q(1 - p)$, and when there is an emergency and the procurer is honest, social welfare is $B_{es} - S$, which occurs with probability, qp . In the equilibrium in proposition 2, a corrupt procurer randomizes between a competitive tender and sole-sourcing, regardless of the state, with $\text{prob}(s|D) = p$. So, for example, the joint probability that a corrupt procurer will use a competitive tender in an emergency is $(1 - p)p$.

Under the FCT regulation, when a corrupt procurer is not fired, expected social welfare in period 2 is zero and when he is fired, expected social welfare in period 2 is $q\Delta_{FCT}$. When an honest procurer is not fired, expected social welfare in period 2 is Δ_{FCT} and when he is fired, expected social welfare in period 2 is $q\Delta_{FCT}$. Thus, under the FCT regulation, expected social welfare is:

$$\begin{aligned} \widehat{SW}_{FCT} = & q\{(1 - p)[(B_{nc} - T) + \Delta_{FCT}] + p[(B_{es} - S) + \hat{\pi}\Delta_{FCT} + (1 - \hat{\pi})q\Delta_{FCT}]\} + (1 - \\ & q)\{(1 - p)^2(B_{nc} - T) + p^2[(B_{es} - S) + (1 - \hat{\pi})q\Delta_{FCT}] + (1 - p)p(B_{ec} - T) + (1 - \\ & p)p[(B_{ns} - S) + (1 - \hat{\pi})q\Delta_{FCT}]\}. \end{aligned} \quad (4)$$

Then using (3) and (4), we get:

$$\begin{aligned} \widehat{SW}_{FCT} - \widehat{SW}_{RCT} = & p[q + p(1 - q)][(B_{es} - S) - (B_{ec} - T)] - p(1 - p)(1 - q)[(B_{nc} - T) - \\ & (B_{ns} - S)] + q(\Delta_{FCT} - \Delta_{RCT}). \end{aligned} \quad (5)$$

By assumption, $(B_{es} - S) - (B_{ec} - T) > 0$. Also, $(B_{nc} - T) - (B_{ns} - S) > 0$ because $B_{nc} = B_{ns}$ and $S > T$. The sign of the expression on the RHS of equation (5) is ambiguous. The intuition is given in the next section. In the meantime, I state the following proposition:

Corollary 2: *Suppose $\theta < K < \theta/(1 - \delta)$. The difference between social welfare under the flexible procurement regulation and the rigid procurement regulation is ambiguous. Rules may be better or worse than discretion.*

3. Inefficiencies in equilibrium: sole-sourcing, competitive tender, and retention

In both cases of small and big gains to corruption, whether a flexible rule is better than a rigid rule has an indeterminate answer. To understand the intuition, one has to understand the role of three sources of inefficiencies in equilibrium. These are (a) competitive tender inefficiency (i.e., using competitive tender in an emergency), (b) sole-sourcing inefficiency (i.e., using sole-sourcing in a non-emergency),³¹ and (c) retention inefficiency (i.e., retaining or not firing a corrupt procurer in period 1).

Under the rigid procurement regulation, the corrupt and honest types of the procurer use competitive tender in period 1 in the equilibrium in proposition 2, regardless of whether there is an emergency or not. Thus, both types of the procurer inefficiently use competitive tender (i.e., in an emergency) with probability, p . In contrast, under the flexible procurement regulation, the honest type never uses competitive tender or sole-sourcing inefficiently. The corrupt type uses competitive tender inefficiently and this occurs with probability $(1 - q)(1 - p)p$, which is less than the probability, p , with which competitive tender is used under the rigid procurement

³¹Note that using sole-sourcing in a non-emergency is inefficient because it gives the same social benefit as competitive tender but sole-sourcing is more expensive. That is, $B_{nc} - T > B_{ns} - S$ because $B_{nc} = B_{ns}$ and $T < S$.

regulation. This smaller *competitive tender inefficiency* is an *advantage* of the flexible procurement regulation and it is the first term of equation (5).³² Under the rigid regulation, both types of the procurer do not use sole-sourcing. So, there is no inefficient use of sole-sourcing. Under the flexible regulation, sole-sourcing is inefficiently used (in a non-emergency) by a corrupt procurer with probability, $(1 - q)(1 - p)p > 0$, which is greater than the probability with which sole-sourcing is inefficiently used under the rigid regulation. This bigger *sole-sourcing inefficiency* is a *disadvantage* of the flexible procurement regulation and it is the second term of equation (5).

Finally, there is a third source of inefficiency. Under the flexible procurement regulation, an honest type is fired with probability, $1 - \hat{\pi} > 0$, for using sole-sourcing while an honest type is not fired under the rigid procurement regulation. The lower probability of firing an honest procurer under the rigid regulation is an *advantage of the rigid procurement regulation* because social welfare is higher in period 2 if the procurer is honest than if he is corrupt. But under the flexible procurement regulation, a corrupt type is fired with probability, $1 - \hat{\pi} > 0$, for using sole-sourcing while a corrupt type is not fired under the rigid procurement regulation. This is an *advantage of the flexible procurement regulation*. It turns out that the balance of these opposing relative *retention* inefficiencies results in an expected social welfare advantage of $q(\Delta_{FCT} - \Delta_{RCT}) > 0$ in favor of the flexible procurement regulation in period 2. This is the third term in equation (5). *Overall, the balance of these three sources of inefficiencies results in an ambiguity of the relative magnitudes of social welfare under the flexible and rigid regulations.* This is the intuition for the result in corollary 2.

³²Note that $p - (1 - q)(1 - p)p = p[q + p(1 - q)]$, which is in the first term of equation (5).

In proposition 1, the same inefficiencies are present. An honest procurer is fired with certainty for using sole-sourcing under the flexible regulation. Under the rigid rule, he is not fired because he does not use sole sourcing. As before, the lower probability of firing an honest procurer under the rigid regulation is an advantage of the rigid procurement regulation because social welfare is higher in period 2 if the procurer is honest than if he is corrupt. But the rigid regulation has a bigger competitive tender inefficiency because the honest type uses competitive tender in an emergency, which does not happen under the flexible procurement regulation. This is an advantage of the flexible procurement regulation.

3.1 A randomization device for sole-sourcing by a corrupt procurer

The discussion of the inefficiencies in the equilibrium in proposition 2 shows that even if a corrupt procurer chooses sole-sourcing with a probability that is equal to the probability of the occurrence of an emergency, it does not necessarily imply that he chooses sole-sourcing efficiently.

In the equilibrium in proposition 2, one may think of a corrupt procurer as choosing sole-sourcing or competitive tender according to $\text{prob}(s) = p$ before the state of the world is revealed as an emergency or non-emergency. But given that p is the probability of an emergency, this is equivalent to choosing sole-sourcing only *after* the revealed state is an emergency. Thus, given the equilibrium in proposition 2, it is reasonable to assume that a corrupt procurer will use the realization of an emergency as his randomization device, which means that he uses sole-sourcing only when there is an emergency.³³

³³If $p = 0.5$, then $p = 1 - p$. We can construct an equilibrium in which a corrupt procurer uses sole-sourcing if there is a non-emergency and competitive tender if there is an emergency. He is not fired when he uses competitive tender and is fired with probability $1 - \hat{\pi}$ if he uses sole-sourcing. He randomizes between sole-sourcing and competitive

If a corrupt procurer uses the realization of an emergency as his randomization device in the equilibrium in proposition 2, then his choice of the procurement method in period 1 is the same as the choice of an honest procurer. Thus, social welfare is:

$$\widetilde{SW}_{FCT} = q\{(1-p)[(B_{nc} - T) + \Delta_{FCT}] + p[(B_{es} - S) + \hat{\pi}\Delta_{FCT} + (1 - \hat{\pi})q\Delta_{FCT}]\} + (1 - q)\{(1-p)(B_{nc} - T) + p[(B_{es} - S) + (1 - \hat{\pi})q\Delta_{FCT}]\}. \quad (6)$$

It can be shown that

$$\widetilde{SW}_{FCT} = (1-p)(B_{nc} - T) + p(B_{es} - S) + q\Delta_{FCT}. \quad (7)$$

Then $\widetilde{SW}_{FCT} - \widetilde{SW}_{RCT} = p[(B_{es} - S) - (B_{ec} - T)] + q(\Delta_{FCT} - \Delta_{RCT}) > 0$. I summarize this result in the following proposition:

Corollary 3: *Given the equilibrium in proposition 2, suppose the procurer uses the realization of an emergency as his randomization device. Then the corrupt procurer is incentivized to obey the flexible procurement regulation and, like the honest type, chooses sole-sourcing efficiently (i.e., uses sole-sourcing only in an emergency). Social welfare is higher under the flexible procurement regulation than it is under the rigid procurement regulation.*

The ambiguity in corollary 2 does not arise in corollary 3. This is because when a corrupt procurer uses the realization of an emergency as his randomization device, there is no sole-sourcing inefficiency under the flexible procurement regulation because the corrupt procurer does not use sole-sourcing in a non-emergency. There is also no competitive tender inefficiency under the flexible procurement regulation.³⁴

tender with the same probability, $p = 0.5$. If $p \neq 0.5$, this equilibrium does not exist. I ignore this equilibrium because $p = 0.5$ is a knife-edge condition. The equilibrium in proposition 2 exists for all $p \in (0,1)$.

³⁴Note also that $\widetilde{SW}_{FCT} - \widetilde{SW}_{RCT} > \widetilde{SW}_{FCT} - \widetilde{SW}_{RCT}$. Therefore, $\widetilde{SW}_{FCT} > \widetilde{SW}_{FCT}$.

4. More results and discussion

Note that as $q \rightarrow 1$, the equation in (5) gives $\widehat{SW}_{FCT} - \widehat{SW}_{RCT} > 0$. This gives:

Corollary 4: *Suppose $\theta < K < \theta/(1 - \delta)$. If the country has a high public sector capacity or integrity (i.e., $q \rightarrow 1$), then a flexible procurement law is better than a rigid procurement law.*

Corollary 4 is consistent with the result in Bosio (2022) and Carril (2022) that stricter laws (regulations) have a negative effect in countries with high public sector capacity or bureaucrats whose preferences are aligned with the public interest (in my case, $q \rightarrow 1$).

Note that $\frac{\partial(1-\hat{\pi})}{\partial K} > 0$. This gives the following corollary:

Corollary 5: *Suppose $\theta < K < \theta/(1 - \delta)$. The bigger is the gain from sole-sourcing to a corrupt procurer, the higher is the probability that the regulator will fire a procurer when sole-sourcing is used.*

In proposition 2, if the procurement regulation is flexible, a corrupt procurer is sometimes not fired for using sole-sourcing because the regulator, although he is conscientious, does not believe that replacing the procurer will lead to a less corrupt procurer. This has the same effect as in countries where procurement regulations are violated with impunity because the regulator is either corrupt and/or not conscientious. Unfortunately, an honest procurer may be fired for using sole-sourcing because the regulator thinks that he may be corrupt.

6. Conclusion

The paper has demonstrated the counterintuitive but interesting result that a flexible procurement regulation may be optimal when the gains to corruption are high. When the gain to corruption is high, a rigid regulation in a second-best environment does not deter the inefficient

use of sole-sourcing by corrupt procurers and yet it does not allow the efficient use of sole-sourcing by honest procurers. However, it has the advantage of weeding out corrupt procurers with a higher probability than the flexible regulation. Although the high gains to corruption implies that this higher probability does not deter corruption in the current period, it increases the chance that the next procurer will be honest.

To the best of my knowledge, this is the first paper to study the optimal *frequency* of sole-sourcing and how incentives could be used to achieve it. However, it is important to emphasize that choosing sole-sourcing with a probability that is equal to the probability of the occurrence of the state (in this case, an emergency) in which sole-sourcing is efficient does not necessarily imply that sole-sourcing is chosen efficiently. As discussed above, there is sole-sourcing inefficiency if the corrupt procurer does not use the realization of the state (emergency) as his randomization device.

In political agency models, the payoffs of bad types depend on the states of the world and their choices. In my model, the payoff of a corrupt procurer is dependent on *only* his actions (i.e., sole-sourcing or competitive tender), *not* on the state of the world (i.e., emergency and non-emergency). This is a reasonable assumption because bribes in procurement need not depend on whether there is an emergency or not but rather on the bargaining power of the bidders and the procurer. In my model, the successful firm -- regardless of whether the procurer is honest or corrupt -- is able to mark up the cost of the contract by a bigger amount under sole-sourcing than under competitive tender (i.e., $S > T$). Therefore, the firm can bribe more under sole-sourcing than under competitive tender (i.e., $K > \theta$). This is consistent with Bosio et al. (2022) who assume that in order to collect a bribe from a bidder (called an insider in their model), the procurer has to exclude

an outsider from bidding. Therefore, the procurer's bribe is bigger when there is one bidder than when there are two bidders.

In countries with high levels of corruption (i.e., q is close to zero) that is not punished, bureaucrats routinely use sole-sourcing and do so with impunity. In such situations, none of the analysis in this paper matters because there is no difference between flexible and rigid competitive tender regulations in terms of social welfare. In such cases, there may be strict procurement laws (on paper) but they are not enforced. This is consistent with the finding by Bosio et al. (2022) that procurement laws tend to be stricter than procurement practices in countries with low public sector capacity.

As argued in section 1, there is nothing wrong with sole-sourcing so long as it is justified. It is too much sole-sourcing that raises eyebrows and is suboptimal. It is not surprising that the public procurement laws of almost all countries allow exceptions to open or competitive tender. As shown in this paper, there exists an equilibrium in which a corrupt procurer can be given discretion and incentivized to choose sole-sourcing efficiently. The misuse of sole-sourcing or discretion that is observed in practice and documented in some academic papers is the result of inefficient regulation or captured (corrupt) regulators.

Appendix A: Proof of Proposition 2

Given $(1 - \delta)K < \theta$, consider the FCT regulation. Under this regulation, an honest procurer will follow the procurement regulations but a corrupt procurer has the incentive to use sole-sourcing and falsely claim that there was an emergency. Let π be the probability that the regulator will *not* fire the procurer *if he uses sole-sourcing* and α be the probability that the

regulator will *not* fire the procurer *if he uses competitive tender*. Finally, let λ be the probability that a corrupt procurer will use sole-sourcing. That is, $\lambda \equiv \text{prob}(s|D)$.

I will first argue that there is no equilibrium in pure strategies. Consider the FCT regulation. If $K + \delta\pi K \geq \theta + \delta\alpha K$, a corrupt procurer (D) will use sole-sourcing in period 1, *regardless of the state*. That is, $\lambda = 1$. Given this strategy by a corrupt procurer and noting that an honest procurer uses sole-sourcing (s) only if there is an emergency, it follows that $\text{prob}(D|s) = \frac{(1)(1-q)}{(1)(1-q) + pq} > 1 - q$, given $p \in (0,1)$. Also, $\text{prob}(D|c) = 0$. So, a corrupt procurer will be fired if he uses sole-sourcing and will not be fired if he uses competitive tender. That is, $\pi = 0$ and $\alpha = 1$. Therefore, $K + \delta\pi K \geq \theta + \delta\alpha K$ implies $(1 - \delta)K \geq \theta$, which contradicts $(1 - \delta)K < \theta$. Thus, given the FCT regulation and $(1 - \delta)K < \theta$, there is no equilibrium in pure strategies in which a corrupt procurer uses sole-sourcing in period 1, regardless of the state. There is also no pure-strategy equilibrium in which a corrupt procurer uses competitive tender in period 1, regardless of the state.³⁵

I look for a mixed-strategy equilibrium. Suppose that, under the flexible regulation, a corrupt procurer uses sole-sourcing in period 1 with probability $\lambda \in (0,1)$, regardless of the state and assume (for a moment) that the procurer is not fired if he uses competitive tender (i.e., $\alpha = 1$). For this mixed strategy to be optimal for a corrupt procurer, we require $K + \delta\pi K = \theta + \delta K$. That is, $\pi = \frac{\theta - (1-\delta)K}{\delta K} \equiv \hat{\pi}$. Note that $\hat{\pi} \in (0,1)$ because $\theta < K < \frac{\theta}{1-\delta}$.

³⁵To see this, note that an honest procurer obeys the flexible procurement regulations. If a corrupt procurer chooses competitive tender, regardless of the state, then $\text{prob}(D|c) = \frac{(1)(1-q)}{(1)(1-q) + (1-p)q} > 1 - q$. So, the regulator will fire a procurer who uses competitive tender. A corrupt procurer will get $\theta < K$. Thus, choosing competitive tender, regardless of the state, is not optimal for a corrupt procurer.

Given the strategies of both a corrupt/dishonest (D) procurer and an honest procurer, we get:

$$prob(D|s) = \frac{prob(s|D)prob(D)}{prob(s|D)prob(D) + prob(s|H)prob(H)} = \frac{\lambda(1-q)}{\lambda(1-q) + pq}. \quad (A1)$$

Suppose that $\lambda = p$. Then equation (A1) implies that $prob(D|s) = 1 - q$. It follows that if $\lambda = p$ and the regulator observes sole-sourcing, the regulator is indifferent between firing the procurer and retaining him. Then it is the regulator's best response to randomize between firing and retaining a procurer when he observes sole-sourcing, where the procurer is *not* fired with probability, $\hat{\pi} \in (0,1)$.

Given that, in equilibrium, an honest procurer uses competitive tender only if there is no emergency, it follows that $prob(c|H) = 1 - p$. Note that $prob(s|D) = p$ also implies that $prob(c|D) = 1 - p$. Therefore, $prob(D|c) = \frac{(1-p)(1-q)}{(1-p)(1-q) + (1-p)q} = 1 - q$. Therefore, the regulator does not fire the procurer if he observes a competitive tender (i.e., $\alpha = 1$) because, by assumption, if the regulator observes competitive tender and is indifferent between retaining and firing the procurer, he retains the procurer. A corrupt procurer has no incentive to deviate from $\lambda = p$. In this equilibrium, he gets $K + \delta\hat{\pi}K$ from using sole-sourcing with probability $p \in (0,1)$ and gets $\theta + \delta K$ from using competitive tender with probability, $1 - p$, where $K + \delta\hat{\pi}K = \theta + \delta K$. This completes the proof of the existence of a mixed-strategy equilibrium.³⁶

³⁶In equilibrium, both sole-sourcing and competitive tender are chosen by both honest and corrupt procurers with positive (equal) probabilities. Sole-sourcing and competitive tender are *not* equilibrium dominated actions for both honest and corrupt procurers. The regulator's beliefs satisfy an equilibrium refinement like the intuitive criterion.

APPENDIX B (Not intended for publication)

Sole-sourcing versus competitive tender: the infinite-horizon case

I briefly consider an infinite-horizon discrete-time version of the preceding two-period game. A period is indexed by $t = 1, 2, \dots, \infty$. In each period, the game is the same as the game in the first period of the two-period game above.

I look for a Markov perfect equilibrium (MPE) of this game. In this type of equilibrium, strategies can only be contingent on the payoff-relevant states of the world and the prior actions taken within the same period (stage game). So, in period t , the regulator does not condition his firing decision on whether the procurer used sole-sourcing or competitive tender in period $t - 1$ or in previous periods. Thus, in each period, the regulator and procurer --- whether a new or retained procurer --- face the same problem as before. Note also that, in any period, a corrupt procurer's payoff is independent of the state (i.e., emergency and non-emergency) and the procurer does not observe the states. These observations imply that the optimal choices for the regulator and a procurer are the same in every period. The value functions do not depend on time.

As before, an honest procurer will follow the procurement regulation under both the FCT and RCT regulations. Now consider the FCT regulation and a corrupt procurer. As before, let λ be the probability that a corrupt procurer uses sole-sourcing and π be the probability that the regulator will *not* fire the procurer if he uses sole-sourcing.

Suppose $\theta < K < \theta/(1 - \delta)$. Suppose the corrupt procurer uses sole-sourcing. Noting that the value functions do not depend on time, I drop time subscripts. The value of sole-sourcing can be written recursively as:

$$V(s|FCT) = K + \delta\pi V(s|FCT). \tag{B1}$$

Equation (A1) gives:

$$V(s|FCT) = \frac{K}{1-\delta\pi}. \quad (B2)$$

For now, assume that if the regulator observes competitive tender, he does not fire the regulator. Then if a corrupt procurer chooses competitive tender, the value of this choice is:

$$V(c|FCT) = \frac{\theta}{1-\delta}. \quad (B3)$$

Then a corrupt procurer will randomize between sole-sourcing and competitive tender if

$$V(s|FCT) = V(c|FCT). \text{ This gives } \pi = \frac{\theta - (1-\delta)K}{\delta\theta} \equiv \tilde{\pi} \in (0,1) \text{ because } \theta < K < \frac{\theta}{1-\delta}. \text{ Given that}$$

in every period an honest procurer uses sole-sourcing with probability, p , we get $prob(D|s) =$

$$\frac{\lambda(1-q)}{\lambda(1-q) + pq} = 1 - q, \text{ if } \lambda = p. \text{ So, if } \lambda = p, \text{ the regulator is indifferent between firing and}$$

retaining the procurer when the regulator observes sole-sourcing. Thus, it is a best response for

the regulator to randomize between firing and retaining the procurer such that the regulator

retains the procurer with probability, $\tilde{\pi}$. Given $\tilde{\pi}$, it is a corrupt procurer's best response to

choose sole-sourcing with probability $p \in (0,1)$. A corrupt procurer gets $V(s|FCT) =$

$V(c|FCT)$. A procurer is not fired if he uses competitive tender because in equilibrium in each

$$\text{period, } prob(D|c) = \frac{(1-p)(1-q)}{(1-p)(1-q) + (1-p)q} = 1 - q \text{ and I assume that if the regulator observes}$$

competitive tender and is indifferent between retaining and firing the procurer, he retains the

procurer.

Note that $V(s|RCT) = K$ and $V(c|RCT) = \theta/(1 - \delta)$. So, $V(s|RCT) < V(c|RCT)$

given $K < \theta/(1 - \delta)$. Therefore, a corrupt procurer will use competitor tender when the

procurement regulation is rigid.

Therefore, if $\theta < K < \theta/(1 - \delta)$, the equilibrium in each period of the infinite-horizon game is the same as the equilibrium in period 1 as stated in proposition 2.³⁷ The only difference is that $\tilde{\pi} > \hat{\pi} = \frac{\theta - (1 - \delta)K}{\delta K}$, given that $K > \theta$. This is similar to the result in corollary 5 in the sense that, under the FCT regulation, the bigger is the gain from sole-sourcing to a corrupt procurer, the higher is the probability that the regulator will fire a procurer when sole-sourcing is used. In this case, the infinite horizon -- *relative to the two-period horizon* -- increases the number of periods over which a corrupt procurer benefits from sole-sourcing, so the regulator fires the procurer with a higher probability (i.e., $\tilde{\pi} > \hat{\pi}$) in the infinite-horizon case.

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³⁷If the regulator retains the procurer in a given period, then his prior belief about the procurer's type in the next period is equal to his posterior belief in the previous period, which is $\text{prob}(H) = q$. Therefore, whether he retains or fires the procurer, his belief in the next period will not change. Thus, he has no incentive to condition his firing decision in a period on the procurer's action in previous periods.

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