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Corruption and Renegotiation in Procurement

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Abstract

A sponsor –e.g. a government agency– uses a procurement auction to select a supplier who will be in charge of the execution of a contract. That contract is incomplete: it may be renegotiated once the auction's winner has been chosen. We examine a setting where one firm may bribe the agent in charge of monitoring contract execution so that the former is treated preferentially if renegotiation actually occurs. If a bribe is accepted, the corrupt firm will be more aggressive at the initial auction and thus win with a larger probability. We show that the equilibrium probability of corruption is larger when the initial contract is less complete, and when the corrupt firm's cost is more likely to be similar to her rivals'. In addition, we examine how this influences the sponsor's incentives when designing the initial contract.

Keywords: Auctions, Cost overruns, Procurement, Renegotiation, Corruption.

JEL classification: C72, D44, D82.

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1 Introduction

Public procurement processes are vulnerable to corruption. The substantial volume of procurement transactions,[1] coupled with the complexity of the process and the close interactions between public officials and businesses, amplify these corruption risks.[2]

Corruption generates sizable costs for public administrations: higher expenses, lower quality of goods, services, and works, inefficient allocations, distortion of competition, etc.[3] This explains the efforts by governments and international organizations to reduce corruption in procurement by enforcing regulations intended to guarantee that each procurement process is open and has been announced well in advance, that the awarding procedure is not biased and that it is monitored by third parties. In this paper, however, we study a subtle way in which corruption may influence the process while not being detected or prevented by these procurement regulations, which mainly focus on the competitive phase. A procurement agent or government official could be bribed in exchange for preferential treatment at different stages of the procurement process. We study the impact that corruption may have on the whole process when it operates at one specific stage: renegotiation.

We model a setting where a sponsor –e.g. a public agency– has to allocate the execution of a contract to one of several potential suppliers. The contract is awarded through an auction. However, the original contract is incomplete: contingencies may arise that make it convenient for both parties to renegotiate. Then, we allow for the possibility that one specific bidder may bribe the agent in charge of monitoring the execution of the project so that the former receives preferential treatment if renegotiation occurs. We show that the

[1]Public procurement, excluding public corporations, represents about 13% of GDP in OECD countries. See *stats.oecd.org* and Bosio et al. (2022), which reports that procurement accounts for 12 percent of global GDP -i.e. around $11 trillion.

[2]The OECD Foreign Bribery Report (2014) provides evidence of the vulnerability of public procurement to corruption. Almost two-thirds of the foreign bribery cases analyzed occurred in sectors closely associated with contracts or licensing through public procurement, such as the extractive, construction, transportation and storage, and information and communication sectors.

[3]For example, the European Union estimated that the cost of corruption was 120 billion per year (European Commission, 2014), representing approximately 1% of the EU GDP and slightly less than the EU's annual budget of 143 billion in 2014.

impact of corruption is not limited to the renegotiation stage. Anticipating better treatment if renegotiation happens, the corrupt firm will bid more aggressively in the auction and thus win more often than it would if corruption were absent. Furthermore, anticipating that corruption may influence the process changes the sponsor's incentives when designing the contract that will be awarded through the auction.

We provide a specific model where the contract is designed, auctioned, possibly renegotiated, and finally executed. Between contract design and the auction itself, a firm may bribe the agent to gain a larger share of the renegotiation surplus when renegotiation actually happens. We characterize the optimal bribe to be offered by the corrupt firm and the equilibrium level of corruption. Our analysis delivers several insights. First, when corruption takes place through this renegotiation channel, the pattern is as follows: prices are lower at the procurement stage but are higher at the end of the process (including the renegotiation payments); and, more importantly, corruption generates inefficiencies at the allocation stage, since the wining firm may not be the most efficient supplier. Second, the optimal bribe falls –and thus corruption is less likely– when the contract awarded through the auction is more complete. In other words, a contract that leaves less room for renegotiation reduces the influence of the form of corruption we examine. Third, the equilibrium probability of corruption is larger when the corrupt firm's cost is more likely to be similar to her rivals'. Better treatment at the renegotiation stage yields a given advantage for the corrupt firm. That advantage is more valuable when it is more probable that it becomes decisive in making the corrupt firm win. Then, it becomes more valuable, generating higher bribes, when the corrupt firm is more similar, in terms of costs, to her rivals.

This result is interesting for the corruption literature. Cost dispersion is, in general, directly related to firms' rents and, then, it can be interpreted as a signal of competition in a particular industry. Therefore, we can read our result as stating that more competitive markets (in which firm's costs differences are small) with low firm profits are more vulnerable to corruption when it takes place through this procurement renegotiation channel. This goes against the traditional view that relates corruption to lack of market competition, which generates rents that can be illegally appropriated.[4] However, if we take the cost dispersion as given, and we measure corruption as the number of bidders participating in the procurement process, we will also show that corruption is decreasing in competition.

Our way of modeling corruption is very likely to be important in reality since renegotiation is prominent in public procurement, as shown for example in Bajari et al (2014) and Decarolis and Palumbo (2015). Moreover, this form of "competitive corruption" fits well with the Odebrecht corruption case described in Campos et al.(2021). In that case, corruption emerged in a construction sector characterized by its competitiveness and low firm profits.

During the period 2001-2016, Odebrecht –the largest engineering and construction company in Latin America– bribed about 600 politicians and public servants in 10 Latin American countries. According to the US Department of Justice (2016), this corruption case was the largest foreign bribery case in history, accounting for 788 millions of dollars in bribes.

Although, in exchange for the bribes, Odebrecht asked for several ways to be favored, the most prominent one was obtaining higher prices during the renegotiation process. Campos et al.(2021) shows that renegotiation revenues in Odebrecht's projects for which there is evidence of corruption were higher than in regular projects. As the theoretical discussion of the case in Campos et al.(2020) and our model predict, this renegotiation advantage translated into an advantage at the bidding stage. Odebrecht multiplied its contracts by a factor higher than 8 between 2003 and 2016 due to its corrupt practices.

Our work is related to the literature on renegotiation and cost overruns in procurement. We borrow from Bajari and Tadelis (2001) and Ganuza (2007) the setting where the sponsor does not know the optimal design of the project ex-ante. She invests in reducing the likelihood that the design fails and renegotiation follows, which would generate additional costs. Their focus, though, is different. Bajari and Tadelis (2001) are mainly interested in the

[4]Rose-Ackerman was one of the first scholars promoting the idea that as competition reduces rents, it also leads to lower corruption. In her book, Rose-Ackerman (1996), she states: "In general any reform that increases the competitiveness of the economy helps reduce corrupt incentives." We provide an additional argument to the literature on competition and corruption that challenges the Rose-Ackerman' principle –see for example Bliss and Di Tella(1997), Celentani and Ganuza (2002) and Laffont and N'Guessan (1999).

choice between fixed-price contracts (better for cost-reduction incentives) and cost-sharing contracts (better for reducing ex-post transaction costs). We ignore this dimension and concentrate on fixed-price contracts, the most widely used contractual arrangement in public procurement. Ganuza (2007) analyzes a competitive procurement setting with horizontally differentiated suppliers. His main result is that systematic cost overruns may arise since the sponsor optimally underinvests in the specification of the initial design in order to promote competition (reducing suppliers' rents). While we do not consider horizontally differentiated suppliers, it is also important in our model that bidders foresee expected contract renegotiation and bid more aggressively when anticipating profits if renegotiation occurs.

Our analysis is connected as well to the literature on favoritism -e.g. Laffont and Tirole (1991), McAfee and McMillan (1989) and Naegelen and Mougeot (1998)– that examines the case where the sponsor herself would prefer that, at a given price, some potential contractors win and not others, as happens when advantages are conferred to local or national firms over their foreign competitors. In particular, our model relies on Arozamena, Ganuza and Weinschelbaum (2023), which shows how renegotiation of the contract can be a way to implement favoritism even when the sponsor is constrained to use a symmetric auction mechanism. Here, whether one firm is favored or not follows from a bribing game where an agent of the sponsor may not act in her principal's best interests.

Finally, our work relates to the literature on corruption in procurement, and in particular to Campos et al. (2020). The model in that paper also points at renegotiation as a way in which a corrupt firm may be favored. There are two main differences with our approach, though. First, they take the probability of corruption as given and view the authority's bias as a result of a bribing contest where one potential supplier holds an advantage -a more efficient bribing technology. Here, we take the favored supplier's identity as given but corruption may or not take place. This depends on the outcome of a bribing game that is determined by the potential surplus generated by the corruption coalition. This allow us to analyze the factors that may impact on the probability of corruption. Second, they examine a setting where the contract to be auctioned off is fixed, while we show that unequal treatment in renegotiation influences contract design.[5]

The rest of the paper proceeds as follows. Section 2 below lays out our model, describing how the procurement contract is designed, how the auction is carried out and how renegotiation, if necessary, may proceed. Section 3 describes the equilibrium behavior that follows and states our main results. Finally, Section 4 concludes.

2 The Model

A sponsor has to hire a contractor to carry out a single, indivisible project. One of two potential suppliers will be selected through an auction. Later we will discuss the case of N bidders. The auction and contract execution will be run by a procurement agent that may be corrupt. We describe in detail the interaction among all parties involved in specifying, auctioning and carrying out the project.

1. *Contract specification*

   The optimal specification of the project is uncertain. There is a set of possible contingencies (states of nature) W that may arise during project execution. The contingency that actually occurs determines the optimal design. Let $e \in [0, 1]$ be the sponsor's effort in specifying the contract. Then, $W^C(e) \subset W$ will be the set of contingencies covered in the contract. Contractually specifying designs for each contingency is costly, though, so the contract chosen by the sponsor will be incomplete. Specifically, let $k(e)$ be the cost to the sponsor of selecting a specification effort e, where $k'(e), k''(e) > 0$, $k'(0) = 0$ and $\lim_{e\to 1} k(e) = \infty$. A larger value of e means that more contingencies are covered: if $e' < e''$, then $W^C(e') \subset W^C(e'')$. The sponsor values the project at v if it is carried out with the exact design that corresponds to the state of nature that occurs during contract execution –for simplicity, we assume that she values the project at zero if not. Then, as we will see below, if the contingency that occurs is not covered

[5] The study of how corruption may impact the design stage has been absent in the literature. See Burguet, Ganuza and Montalvo (2018) for a survey.

in the initial specification, the contract will have to be renegotiated. To simplify, we assume that if the sponsor selects specification effort e, then the probability that the contingency actually occurring is covered in contract $W^C(e)$ is also e.

2. Bribing stage

   The procurement agent that will run the project may be bribed. One of the potential contractors, firm 1, offers a bribe b to her in exchange for preferential treatment if renegotiation is necessary. We describe in detail how firm 1 will be favored when we introduce the renegotiation stage below. If the procurement agent takes the bribe, she incurs a cost τ. This cost includes expected penalties, but possibly idiosyncratic factors related to moral costs as well. Cost τ is distributed according to a c.d.f. $G(.)$ that is continuous, strictly increasing, and has a density $g(.)$. We assume that $x + \frac{G(x)}{g(x)}$ is increasing. Initially, then, the procurement agent learns the value of τ (her private information), and firm 1 makes an offer. The agent can only accept or reject that offer.

3. Auction

   A contractor is selected to carry out contract $W^C(e)$ through a second-price, sealed-bid auction.[6] So as to simplify, we assume that, for any $W^C(e)$, firms' costs of executing the project are i.i.d. Specifically, firm i's cost is distributed uniformly on the interval $[c - B, c + B]$, $i = 1, 2$, where $B > 0$. Then, c is both firm's expected costs, and B provides a measure of cost dispersion in the market. Both firms learn their costs, which are private information, before the auction takes place. Note that we are assuming, for simplicity, that expected costs are independent of contract specification.

4. Contract execution and renegotiation

   As we mentioned above, the actual contingency occurring, which we will denote by

[6]Given that, due to corruption, bidders may not be symmetric ex ante, revenue equivalence will not hold under our assumptions. Still, our results should be qualitatively valid for any auction format. We use the second price auction since it greatly simplifies our analysis.

w^*, is revealed after the auction but before contract execution. If $w^* \in W^C(e)$ (which happens with probability e), the initial contract can be implemented by the winning bidder without changes. However, if $w^* \notin W^C(e)$, the procurement agent and the winning contractor have to renegotiate the contract so that its execution yields value to the sponsor. The cost of adapting the contract to the new contingency w^* is $c_{w^*} < v$ for any contractor.[7] We model renegotiation as a two-stage variation of that in Bajari and Tadelis (2001). First, renegotiation effort λ is chosen by the procurement agent. The cost of effort is given by $\beta\lambda^2/2$, where $\beta > 0$ captures the agent's bargaining efficiency. At the second stage, with probability $\lambda > 0$ the agent makes a take-it-or-leave-it (TIOLI) offer to the contractor, and with probability $1 - \lambda > 0$ it is the winning firm that makes the TIOLI offer. If the agent has not taken a bribe from firm 1 or firm 1 has not won the auction, she will select a renegotiation effort that maximizes the sponsor's expected utility. However, if she has taken a bribe and firm 1 won, she will treat the bribing firm preferentially. She will act as a representative of firm 1 and select $\lambda = 0$.[8] Once renegotiation (if necessary) is over, the contract is executed. We assume that $v \geq c + B + c_{w^*}$, so that the project is carried out even if renegotiation is certain.

3 Equilibrium

We solve the model backwards, starting at the final stage in renegotiation.

3.1 Renegotiation.

Recall that, under our assumptions, the surplus from renegotiation, $v - c_{w^*}$, will always be generated. Given that the procurement agent has chosen a renegotiation effort λ, if that agent makes a TIOLI offer (which happens with probability λ) she will just compensate the

[7] We simplify greatly by assuming that c_{w^*} is independent of the initial contract and of the exact contingency that occurs.

[8] The agent may face constraints that impose a minimum but positive value of λ. Since our results would not change with those constraints, we assume they do not exist.

winning contractor for the adaptation cost c_{w^*}. If the contractor makes the offer (which happens with probability $1-\lambda$), she will be paid v and seize the entire renegotiation surplus. Then, the contractor's expected profit from renegotiation is $(1-\lambda)(v-c_{w^*})$, while the sponsor's expected profit is $\lambda(v-c_{w^*})$.

At the first stage of renegotiation, λ is chosen by the agent. If the auction's winner is firm 1 and a bribe has been accepted, as we mentioned above, the agent will choose $\lambda = 0$, ensuring that the corrupt firm seizes all the surplus. In any other circumstance, the agent will solve

$$\max_{\lambda \in [0,1]} \quad \lambda(v-c_{w^*}) - \beta\frac{\lambda^2}{2}.$$

so that

$$\lambda^* = \frac{(v-c_{w^*})}{\beta}$$

Any firm not bribing will have expected profit from renegotiation

$$\pi^R = (1-\lambda^*)(v-c_{w^*}) = (1-\frac{v-c_{w^*}}{\beta})(v-c_{w^*})$$

If firm 1 has successfully bribed the agent, though, its surplus from renegotiation is

$$\pi^{Rc} = (v-c_{w^*}) > \pi^R$$

Then, the bribing firm will hold an advantage when bidding, as we will see below.

3.2 Awarding process. The second-price auction.

We move back now to the second-price auction. For any participating firm, it is weakly dominant to submit a bid such that, if it won and was compensated according to that bid, its expected profits would be zero. Focusing on this weakly dominant bidding equilibrium, all contractors will discount in their bids any expected profits from future renegotiation.

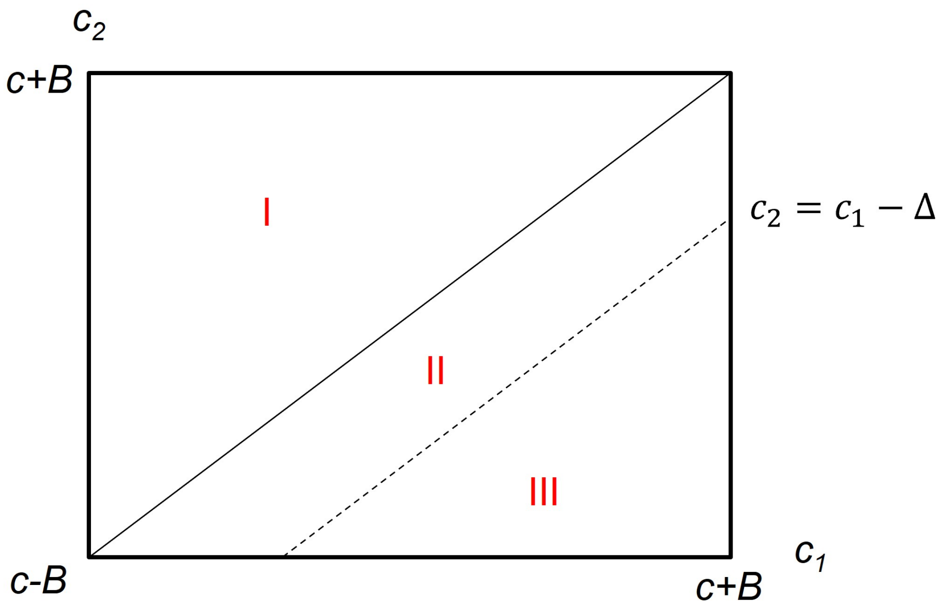

Figure 1 : Project allocation and corruption

That is, if the agent has not taken a bribe from firm 1, firm i $(i = 1, 2)$ will bid

$$P_i^* = c_i - (1-e)\pi^R,$$

where the second term on the right-hand side is the expected renegotiation profit. If the agent has taken a bribe, though, firm 2 will bid just as above, whereas firm 1's dominant bid will be

$$P_1^* = c_1 - (1-e)\pi^{Rc}.$$

Let

$$\Delta = (1-e)(\pi^{Rc} - \pi^R) = (1-e)\frac{(v - c_{w^*})^2}{\beta}$$

be firm 1's expected extra profits from renegotiation when it has bribed the agent.[9] This renegotiation advantage impacts the auction just as a cost advantage would. The auction's result, as a function of firms' costs, is depicted in Figure 1.

[9] We will concentrate in what follows in cases where $\Delta < 2B$. Otherwise, the advantage obtained by firm 1 would make it impossible for firm 2 to compete in the procurement auction.

Without bribing, firm 1 wins if $c_1 < c_2$, that is, in region I in the figure, while firm 2 wins in regions II and III. When the agent has taken a bribe, firm 1 wins when $c_1 - \Delta < c_2$ i.e in regions I and II. In spite of the advantage corruption provides to firm 1, firm 2 still wins in region III -although it receives a lower price, since firm 1 is bidding more aggressively. Region II captures the inefficiency costs of corruption, since the less efficient firm undertakes the project. Note that Δ is decreasing in e. Then, a more complete contract, by reducing the scope for renegotiation, makes firm 1's advantage when bribing smaller, so region II and allocation inefficiencies shrink.

3.3 Corruption profits

Ex ante, then, firm 1's expected profit if it has not bribed is

$$\Pi_1 = Prob(c_1 < c_2)E[c_2 - c_1 | c_1 < c_2] = \frac{B}{3}$$

There is no profit from renegotiation since expected renegotiation surplus is competed away when bidding. If it has bribed the agent, firm 1's expected profit is

$$\Pi_1^c = Prob(c_1 - \Delta < c_2)[E[c_2 - c_1 | c_1 - \Delta < c_2] + \Delta]$$

$$= \frac{8B^3 + 12B^2\Delta + 6B\Delta^2 - \Delta^3}{24B^2}$$

In this case, firm 1 seizes a positive expected profit from renegotiation: given that it will be treated preferentially at the renegotiation stage, not all its surplus will be completed away when bidding.

The ex-ante extra profit derived from corruption, then, is

$$\Pi_1^c - \Pi_1 = \frac{\Delta}{2} + \frac{\Delta^2}{4B} + \frac{\Delta^3}{24B^2}$$

The additional expected profit that firm 1 obtains when bribing is thus increasing in Δ

and decreasing in B. A rise in Δ makes bribing more attractive, since the extra profits that renegotiation yields are larger. In addition, when B grows, cost distributions are more dispersed, which implies that firm 1's advantage when bribing changes the auction's outcome with lower probability -i.e. the probability that costs take values in region II in Figure 1 falls.

Using Figure 1, we can give a more general interpretation of expected corruption profits. Firm 1's expected profit without corruption is just the expected value of the difference between firms 2's cost and firm 1's in region I, where $c_2 > c_1$. That is, $\Pi_1 = \int\int_{R_I}(c_2 - c_1)f(c_2, c_1)dc_2dc_1$. With corruption, firm 1's expected profit is the expected value of the same cost difference plus the corruption advantage Δ in regions 1 and 2, where $c_2 > c_1 - \Delta$: $\Pi_1^c = \int\int_{R_I+R_{II}}(c_2 - c_1 + \Delta)f(c_2, c_1)dc_2dc_1$

Then, additional profits for corruption can be written as

$$\Pi_1^c - \Pi_1 = \frac{\Delta}{2} + \int\int_{R_{II}}(c_2 - c_1 + \Delta)f(c_2, c_1)dc_2dc_1$$

Now, it is intuitive to see that, even without the uniform distribution, the more disperse the cost distribution is, the less mass there will be around the diagonal (where costs are closer to each other), and the lower will be $\int\int_{R_{II}}(c_2 - c_1 + \Delta)f(c_2, c_1)dc_2dc_1$, so the gains from and the incentives to be involved in corruption will fall.

Using this way of writing the profits, we can also discuss the case of N bidders. In that case, the distribution of c_2, is the distribution of the minimum of a sample of $N-1$ bidders. The distributions are no longer symmetric, but the same analysis remains valid. We will have

$$\Pi_1^c - \Pi_1 = \frac{\Delta}{N} + \int\int_{R_{II}}(c_2 - c_1 + \Delta)f_N(c_2, c_1)dc_2dc_1$$

Although it requires formal proof (to be done), it seems intuitive that this is decreasing in N. That the first term is decreasing in N is straightforward. In the case of the second term, more competitors will mean that the probability that the cost of the best competitor falls in region II will be lower.

3.4 The bribing game.

Moving back to the bribing stage, firm 1 has to decide which bribe b it will offer. The procurement agent will take the bribe if it outweighs its cost -i.e. if $b > \tau$. So the probability that a bribe b will be accepted (the probability of corruption) is $G(b)$. Then, firm 1 chooses the bribe b that solve the following problem.

$$\max_{b} \quad \Pi_1^c G(b) + \Pi_1(1 - G(b)) \tag{1}$$

Let b^* be the optimal bribe, the solution of firm 1's bribing problem. It satisfies

$$\begin{aligned} b^* + \frac{G(b^*)}{g(b^*)} &= \Pi_1^c - \Pi_1 \\ &= \frac{\Delta}{2} + \frac{\Delta^2}{4B} + \frac{\Delta^3}{24B^2}. \end{aligned}$$

We can now state an interesting comparative statics result

Proposition 1 *The equilibrium bribe and the probability of corruption are decreasing in the level of specification e and in cost parameter B.*

The left-hand side of the first order condition is increasing in b^*, and the right-hand side is decreasing in e (since Δ is decreasing in e) and B, so the result follows.

The second part of Proposition 1 states that the probability of corruption falls with B. When B increases, cost dispersion is larger. As we mentioned above, it becomes less likely that the corruption advantage makes firm 1 win when it would lose without bribing. Thus, the incentives to bribe are lower.

The first part –i.e. that the equilibrium probability of corruption falls with the specification effort e– suggests that an effective way of coping with the form of corruption that we are analyzing should be increasing contract specification. Indeed, we can now complete our description of the equilibrium by moving back to the contract specification stage, and verify that this is the case.

3.5 Specification stage

Without corruption, the sponsor's expected surplus (without considering specification costs) is given by

$$\Pi_S = v - E(max(c_1, c_2)) - (1-e)c_{w^*}$$
$$= v - c - \frac{B}{3} - (1-e)c_{w^*}$$

If a bribe is accepted, that surplus is

$$\Pi_S^c = v - E(max(c_1 - \Delta, c_2)) - (1-e)c_{w^*}$$
$$-(1-e)Prob(c_1 - \Delta < c_2))\Delta$$

Anticipating the possibility of corruption when selecting a specification level, the sponsor's problem is

$$max_e \quad \Pi_S^c G(b^*) + \Pi_S(1 - G(b^*)) - k(e) \tag{2}$$

If corruption were impossible, the sponsor would solve

$$max_e \quad \Pi_S - k(e) \tag{3}$$

We can now compare the solutions to these problems

Lemma 2 *The sponsor selects a more complete contract with than without corruption.*

Proof. In problem (3), the first-order condition is

$$\frac{\partial \Pi_S}{\partial e} = k'(e) \tag{4}$$

The first-order condition for problem (2) is

$$\frac{\partial \Pi_S}{\partial e} + (\frac{\partial \Pi_S^c}{\partial e} - \frac{\partial \Pi_S}{\partial e})G(b^*) + (\Pi_S^c - \Pi_S)g(b^*)\frac{db^*}{de} = k'(e) \tag{5}$$

Since, from Proposition 1, $\frac{db^*}{de} < 0$, and given that $\Pi_S^c < \Pi_S$, the third term on the left-hand side in (5) is positive. A few computational steps yield

$$\frac{\partial \Pi_S^c}{\partial e} - \frac{\partial \Pi_S}{\partial e} = \frac{(1-e)(3B-\Delta)(\pi^{Rc} - \pi^R)^2}{2B^2}$$

In our cases of interest (see footnote 9), we have $3B - \Delta > 0$, so the second term on the left-hand side in (5) is also positive. Given that $k'(e)$ is increasing, then, the solution to (5) is larger than the solution to (4). ■

4 Conclusions

Procurement auctions are often regulated to ensure equal treatment for all bidders. In this paper, we show that when contracts can be renegotiated this does not prevent the possibility of corruption. Firms may bribe procurement agents in exchange for receiving advantageous treatment during the renegotiation of the contract. We also show that the corrupt firm, knowing it will receive preferential treatment during renegotiation, will bid more aggressively in the initial bidding process, increasing its likelihood of winning. This generates allocation inefficiencies since less efficient corrupt firms may win procurement contracts. Additionally, by underinvesting in design specifications, the likelihood of renegotiation increases, leading to a higher probability of corruption. Taking this into account, the sponsor, in order to limit the corruption of the procurement agent, invests more in specifying the initial contract than in the case without corruption.

While we have theoretically demonstrated the existence of this channel to implement corruption, we hope future empirical research will explore how firms' bidding behavior is influenced by contract renegotiation, whether, and how the probability of corruption alter the sponsor's incentives to invest in detailed initial contract specifications. Even, it is possible that our result can be used to identify some corrupt public agencies by analyzing the pattern of contract renegotiation in past procurement processes.

From a policy perspective, this paper raises important challenges since regulating renegotiation is significantly more challenging than regulating the procurement auction. Limiting renegotiation directly may be counterproductive, leading to important inefficiencies. As our analysis shows, regulatory restrictions on the renegotiation phase have to be combined with more detailed initial contracts. However, this is costly and may be difficult for some administrations that lack technical capabilities and that at the same time, could be the ones more threatened by the risk of corruption.

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