

Volume 39, Issue 1

Transparency in repeated procurement: when hiding is better

Berardino Cesi
University of Rome Tor Vergata

Adriano Di Natale
University of Rome Tor Vergata

Abstract

In this paper we study the effect of transparency on the willingness to collude in repeated procurement competitive tenderings. We allow the buyer to postpone the revelation of the winner's identity and show that such a policy may make collusive agreements less stable in both simultaneous and sequential competitive procedures. When the buyer postpones the revelation of the winner's identity in a scenario in which colluding and "honest" (never colluding) firms participate to the same tendering, the threat of a retaliation, by means of an aggressive bidding by the colluding firms, is weakened and collusion is less stable

Citation: Berardino Cesi and Adriano Di Natale, (2019) "Transparency in repeated procurement: when hiding is better", *Economics Bulletin*, Volume 39, Issue 1, pages 14-23

Contact: Berardino Cesi - berardino.cesi@uniroma2.it, Adriano Di Natale - adriano.dinatale@outlook.com

Submitted: October 23, 2018. **Published:** January 10, 2019.

1 Introduction

Most of the procurement laws and guidelines around the world (UNICITRAL Model Law on Public Procurement, EU and Russian legislation) confirm an increase in the level of transparency requirements as the most effective way to fight and eradicate corruption in public procurement (Bergot *et al.* 2010). Information about key stages of procurement processes, decisions and outcomes are generally publicly available to numerous public and concerned parties, because of mandatory law requirements. However, economic literature has also pointed out that transparency requirements may expose public authorities to the risk of collusive behaviors among public procurement stakeholders. Morozov and Podkolzina (2013) show how transparency policies in procurement may induce firms to agree on collusive offers and enjoy extra profit from the collusive behavior. In line with the extant literature, those transparency requirements may: i) provide clear focal points, ii) reduce the cost of monitoring other members of a collusive agreement iii) enforce a more effective retaliation against cartel's deviators. Albano *et al.* (2006) suggest precautions that might be adopted to tackle this issue: publish anonymous bids, limit the number of bids published or the bids in their last digits. The impact of public information dissemination on bidding behavior in procurement is also confirmed in laboratory experiments and econometric studies (See Kagel *et al.* 1987; Goeree, Offerman, (2002). For the empirical analysis see De Silva *et al.* 2003; Albano and Spagnolo (2005); De Silva *et al.* 2007). In this paper we show that *ex post* information disclosure of the identity of the winner may affect the stability of collusion according to whether the buyer runs simultaneous or sequential auctions.

Albano and Spagnolo (2010) provide a theoretical model to study collusion under both sequential and simultaneous auctions when the buyer splits the contract in two lots. To tackle the effect of transparency on collusion we modify their model by introducing two new ingredients: 1) a honest firm never involved in a cartel that may decide either to bid aggressively or to accommodate 2) the possibility for the buyer to postpone the announcement of the winner's identity. We show that when there exists a firm not involving in a cartel the sustainability of a collusive agreement always decreases in the lag the buyer waits to reveal the identity of the winner. In particular, this results holds in both simultaneous and sequential procedures, suggesting that less transparency, under some circumstances, is likely to fight collusion in repeated procurement.

In a sequential format, the buyer sequentially launches the auction for each contract within the same period, participants bid, first for one lot and once the auction for the first lot is over they bid for the second. At the end of the first round of bids, the buyer awards the lot and

it proceeds tendering the second contract. The identity of the winner will be kept secret for T periods and it will be disclosed at the end of each auction in each lot once these T periods are over; in other words at the end of the first auction, occurring after the T periods, the identity of the previous winner has made public. In the simultaneous format instead the buyer simultaneously launches the auctions for both contracts, participants bid for both contracts and the two lots are awarded at the end of period. The buyer keeps the identity of the winner secret for T periods and it will be disclosed at the end of the auction taking place (simultaneously on both lots) after these T periods are over. Given the presence of the honest firm, in each period the colluding firms have beliefs about the behavior of such a firm that, with a certain probability, may either bid a reserve price or bid aggressively. The "soft" bidding of the reserve price by the honest firm is in turns justified by the idea that such a firm, although honest, has beliefs about the "possible" collusive behavior of the other firms and may try to gain an (expected) collusive profit even without taking part to a collusive scheme. In this scenario the colluding firm cannot optimally start the punishment path because, without transparency, there exists the risk of punishing a firm that is sticking to the collusive behavior.¹

In line with the collusive behavior of Albano and Spagnolo (2010) we assume that in the sequential auction bidders apply a "bid rotation" strategy such that in each period the winning candidate of the collusive scheme bids the reserve price while the other uses a phony bid slightly higher than the reserve price. In a simultaneous auction instead the two firms follow a "split the cake" collusive strategy such that the two lots are split in a way that the winning candidate bids the reserve price in each lot. The introduction of a honest firm in the setting of Albano and Spagnolo (2010) fits the real procurement scenario in which there exist some "honest" firms that are not involved in a collusive agreement even though collusion still exists. The existence of a honest firm, that *ex ante* may steal the two lots, increases the willingness to deviate for a colluding firm because, if the buyer has not revealed the identity of the winner, an immediate retaliation cannot be optimal.

Our main conclusion is that the principle of transparency in public procurement may conflict with the necessity to fight collusion since, under transparency, any possible deviators may be readily spotted and punished by the cartel. The public buyer can reduce the degree of transparency to make potential cartel unstable when also honest firms are expected to participate to the competitive tenderings.

In the section 2 we state the model and give the main result. Section 3 concludes.

¹This scenario is clearly similar to the framework of demand shocks in Green and Porter (1984) where colluding firms cannot fully observe whether the profit loss is due to a demand shock or a cheating behavior.

2 The model

We follow the set up in Albano and Spagnolo (2010). A public buyer wants to procure two procurement contracts (A and B) for an infinite number of periods, each denoted by t , with $t = 0, \dots, \infty$, through a lowest-price sealed-bid auctions with a reserve price, either sequentially or simultaneously, when only fixed price contracts are available to the buyer. Three long-lived firms, denoted by subscripts $i = 1, 2, 3$, can deliver the project. All firms share the same discount factor, δ , and production cost, c , for undertaking two equivalent procurement contracts. Each firm perfectly know its own and the rival's cost.²

The buyer commits to the same publicly announced reserve price, r , for each contract, with $r > c$. Let us to keep the same jargon in Albano and Spagnolo (2010) and define the highest profit given by $v = r - c$. In Albano and Spagnolo (2010) all the relevant informations are disclosed by the buyer (bids and identity of the firm winning the competitive tendering), here instead we aim to study the effect of *ex post* disclosure policies on the willingness to collude and we move one step ahead respect to the disclosure policy suggested in Albano and Spagnolo (2006).³We propose an alternatively way of proceeding: the buyer is allowed to delay the public announcement of the winner's identity, until one of the successive rounds of the repeated auction is completed and the participants submitted their bids. The game for the two formats are the following:

Sequential format : At time t , the buyer sequentially launches the auction for each contract; participants bid, first for the first lot and once the auction for the first lot is over they bid for the second. At the end of each sub-round of bids, the buyer awards the lot to the lowest bid, then, it proceeds tendering the second contract. At the end of each sub-round it does not reveal the identity of the winners. The identity will be kept secret for T periods and it will be disclosed at the end of each auction for each lot at $t + T$. In other words, the buyer will announce the winner of the first lot (let's say) A , launched at t , only after the conclusion of the bids for the lot A , at time $t + T$.

Simultaneous format : At time t , the buyer simultaneously launches the auction for both

²The assumption of complete information among participants has been commonly used in procurement because it is realistic for many procurement situations (Albano and Spagnolo, 2010). An example is the consultancy procurement market in territory of Luxembourg: the market is settled down, with participants (the so-called big four) that are long-term rivals with massive know-how exchanges and knowledge of the market. The same assumption for models of repeated procurement is used in Albano et al. (2017) and Spagnolo and Calzolari (2009).

³In particular, 1) Do not announce the winning bid price, 2) the winners' identities, 3) the losing bids or 4) the non-winners' identities.

contracts; participants simultaneously bid for both contracts and, at the end of period, the buyer awards each lot to the lowest bid. At the end of each period it does not announce the winners' identity of the lots, it will be kept secret for T periods and it will be disclosed at the end of the auctions taking place at $t + T$. In other words, the buyer will announce the winner of the lots, launched in t , only after the conclusion of the bids for the two lots at $t + T$.

We follow Albano and Spagnolo (2010) in modelling a collusive scheme between firm 1 and 2, but we also assume that firm 3 is honest and it does not enter any collusive agreement and no communication is undertaken with firm 1 and 2.

The firms 1 and 2' strategies follows the ones in Albano and Spagnolo (2010). When colluding, firm 1 and 2 cannot control for the bid of firm 3 that can be either aggressive or not. On the other hand, firm 3 does not know the existence of a possible cartel made by firm 1 and 2, but it cannot exclude that it may occur. In any case it will never follow a collusive behavior because of its honesty. Thus *ex ante* firm 1 and 2 in turn cannot exclude that, even not taking directly part to the cartel, firm 3 could even bid the reserve price. To easily model this scenario we assume that firm 1 and 2 have the following believes on the bidding behavior of firm 3: firm 3 bids aggressively (a price lower than the reserve price) with probability $1 - \alpha$ whereas it bids the reserve price with probability α . We assume that the tie-breaking rule is a flip of the coin.

The trigger-collusive strategies of each firm depends on the format. In the sequential format firms apply a "bid rotation" strategy, denoted by σ_R , whereas for the simultaneous format they apply a "split-award" collusive strategy, σ_S , where:

σ_R : at time t , firm i bids $b_i = r$ in both contracts at time t and $b_i > r$ at any time $t + 1$, if up to time t firm $j \neq i$ has bid $b_j > r$ in both contracts; otherwise it reverts to the bid of the static equilibrium for ever.

σ_S : at time t , firm i bids $b_i = r$ in contract A and $b_i > r$ in contract B , if up to time t firm $j \neq i$ has bid $b_j > r$ in contract A ; otherwise it reverts to the bid of the static equilibrium for ever.

When suppliers decide to collude they support the ring by the threat of reverting to competitive behavior forever in case a deviation is observed. This punishment is optimal in this symmetric environment as it minimaxes the deviator, exactly as in a symmetric Bertrand supergame. It is possible to note that the behavior of firm 3, as "exogenously" modelled, does not affect the standard static Nash equilibrium profits of the auction.

If firm 3 bids the reserve price in a sequential format, the static collusive profit obtained by the winning candidate for the cartel is v , given the tie-breaking rule. In fact, with probability

α firm 3 bids the reserve price and the buyer flips the coin to award the two lots between the winner from the cartel and firm 3, the expected static profit for the winning member of the cartel is $\alpha \left(\frac{1}{2}v + \frac{1}{2}v\right) = \alpha v$. Clearly the profit is zero with probability $1 - \alpha$. By the same argument the static collusive profit for the simultaneous format is $\alpha \frac{v}{2}$.

Because of the uncertainty about firm 3's behavior, firm 1 and 2 start the punishment phase only when the identity of the winner is revealed because, in case one of the member of the cartel does not get the contract, it may be either because firm 3 has won the auction or because of a deviation. Although we do not introduce in the action set of the firms the possibility of revealing or not their identity, the cheating firm has clearly no incentive to make the result of the auction public. The result would be less straightforward for the honest firm. In principle the honest firm, if strategic, may find it profitable to reveal or not its identity as long as the collusive firms keep colluding and bidding high price. In this case, in fact, the honest firm would increase its expected profit since there still exists the possibility to win by undercutting a collusive high price. However, as long as any cheating firm may have no incentive to reveal their identity, it is not clear whether the revelation by the honest firm would affect the beliefs of the dishonest firm about the possibility of being detected or detect a deviation. Clearly a revelation may protect a cheating firm from retaliation but on the other hand a non revelation in turn does not necessarily induce a non-cheating firm to start the punishment path. However in general the rules of the procedures firms and buyer must stick to are assumed public knowledge and accepted by the participants when taking part to the procedure. These rules are enforceable by the buyer by means of the power of a court of law. However, it is important to stress that in practice the decision about the revelation does not stand in the firms' hands. United Nation General Terms and Conditions of Contract (Art.11 and 12) and the European Union procurement Directive 2014/24 explain that the buyer has the power to set specific disclosure policies in the tender documents (the General Terms and Conditions of contract) and it may oblige the suppliers to ask prior authorization before advertise or make public, for purposes of commercial/visibility advantage, any information and contractual relationship with the Contracting Authority itself. Since the request is scrutinized by the buyer, it is plausible that in our scenario the buyer denies such a publicity if it is willing to fight possible cartels. If the winner does not stick to these transparency policy, i.e. by revealing some information whose revelation is forbidden, this would be a clear infringement of the law.⁴

⁴We thank the referee for rising this point. This analysis could be formalized for future research in a richer model in which players can also be strategic in setting the decision of revealing or not their identity.

Let's define the following expected profits:⁵

Sequential format a) firm 3 bids the reserve price and firms $i = 1, 2$ collude, then the winning candidate of the cartel gains αv , b) firm 3 bids the reserve price and (one) firm $i = 1, 2$ deviates, then the deviating firm gains $2\alpha v$, c) firm 3 bids aggressively, the profit for firm $i = 1, 2$ is zero under but collusive and deviating behavior.

Simultaneous format a) firm 3 bids the reserve price and firms $i = 1, 2$ collude, then the winning candidate of the cartel gains $\alpha \frac{v}{2}$, b) firm 3 bids the reserve price and (one) firm $i = 1, 2$ deviates, then the deviating firm gains $2\alpha v$, c) firm 3 bids aggressively, the profit for firm $i = 1, 2$ is zero under but collusive and deviating behavior

The following Proposition gives the main result of the paper:

Proposition 1 Let δ_R and δ_S be:

$$\delta_R^T (1 + \delta_R)^2 - \delta_R^T - 2 = 0$$

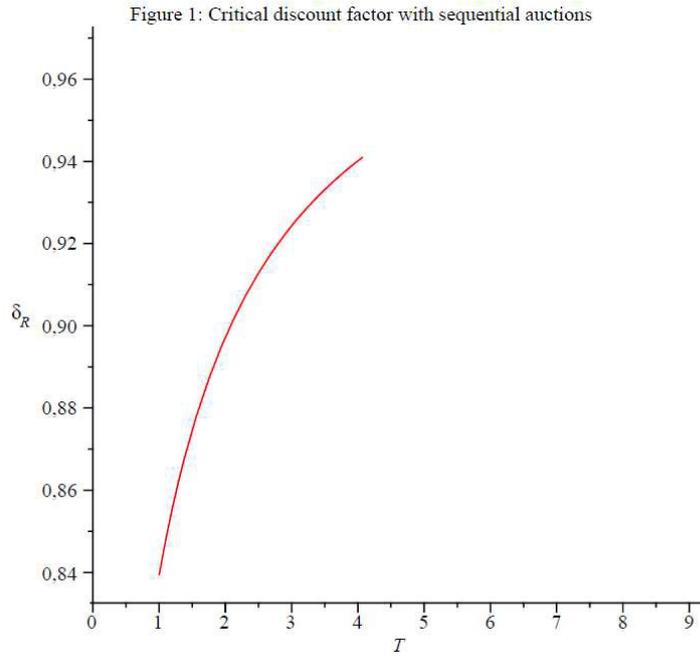
and

$$\delta_S = \frac{3}{4} \frac{1}{T+1}$$

The strategy profiles σ_R and σ_S characterize a SNE respectively under a sequential competitive tendering when $\delta \geq \delta_R$ and under a simultaneous competitive tendering when $\delta \geq \delta_S$.

Proposition 1 shows that less transparency about the identity of the winner (an increase in T) would increase δ_S and δ_R , then it makes collusion less stable. This result is in line with the standard argument about collusion in repeated game such that, the higher the transparency about the actions played by the players more effective is the punishment enforcing the collusive agreement. When the actions (bids) of the firms are made public, firms are perfectly able to check each other after each auction, therefore the threat of retaliation (by means of an aggressive bidding) is credible and it makes the collusive agreement stable. With lower transparency in fact the buyer makes such a retaliation less credible. Thus, we conclude that reducing transparency in repeated procurement reduces the risk of collusion in both simultaneous and sequential competitive procedures. See Figure 1 for a graphical explanation of this result for the case of sequential auctions (where we plot the critical discount factor for a "reasonable" lag in the revelation of the winner's identity)

⁵We assume that the deviation price of the cheating firm is higher (because marginally close to the reserve price) than the aggressive price of firm 3.



3 Conclusions

Transparency has been considered one of the best practices against corruption in procurement. In this paper we tackle this argument by showing that a lower degree of transparency however is a good practice to fight collusion when the buyer runs both simultaneously and sequential competitive procedures. We introduce the possibility for the buyer to postpone the winner's identity in a repeated procurement scenario. Postponing such an information makes the retaliation strategy of colluding firms more credible and increases the incentive for a maverick firm to destroy a collusive agreement. Such a policy is more suitable when the market is characterized by the presence of "honest" firms that would never enter a collusive agreement. This framework fits some of real procurement scenarios where cartels and honest firms coexist.

Appendix

Proof of Proposition 1 Consider $T \geq 1$. The collusive profit for each firm when sticking to the collusive path of σ_R is:

$$V^C = \frac{\delta}{1 - \delta^2} \alpha v$$

whereas when deviating at time $t = 0$, the discounted profits are:

$$V^D = \sum_{t=0}^{T-1} \delta^t (2\alpha v) + \delta^T \alpha v + \sum_{t=T+1}^{\infty} \delta^t (0)$$

with:

$$V^D = \frac{1 - \delta^T}{1 - \delta} (2\alpha v) + \delta^T \alpha v$$

let's define δ_R as the lowest (critical) discount factor obtained from solving $V^C - V^D = 0$, that is the net benefit from collusion, then we have:

$$V^C - V^D = \alpha v \frac{\delta_R^T (1 + \delta_R)^2 - \delta - 2}{(1 - \delta_R^2)} = 0 \quad (1)$$

Let's take a simplified version of the net benefit:

$$F(\delta_R, T) = \delta_R^T (1 + \delta)^2 - \delta - 2 \quad (2)$$

The critical discount factor δ_R^T solving $F(\delta_R, T) = 0$ gives the lowest discount factor such that collusion is stable. The collusive profit for each firm, when sticking to the collusive path in σ_S , is:

$$V^C = \frac{1}{1 - \delta} \alpha \frac{v}{2}$$

whereas when deviation at time $t = 0$, the discounted profits are:

$$V^D = \sum_{t=0}^T \delta^t (\alpha 2v) + \sum_{t=T+1}^{\infty} \delta^t (0)$$

that gives:

$$V^D = \alpha \frac{1 - \delta^{T+1}}{1 - \delta} 2v$$

Where $V^C \geq V^D$ gives:

$$\delta \geq \delta_S = \frac{3}{4}^{\frac{1}{T+1}}$$

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