Efficiency and Bid Rigging in Simultaneous Procurement Auctions under Oligopoly

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Abstract

Splitting of large procurements into several smaller ones has been propagated, for example in the European Union and OECD members, as a way for enhancing competition and improving institutional framework for market efficiency. This paper presents a conceptual argumentation on

This is an Accepted Manuscript of an article published by Inderscience in International Journal of Procurement Management (IJPM, Vol. 13, No. 2, 2020) on 9 April 2020, available online: https://doi.org/10.1504/ijpm.2020.10021016

the causes and consequences of potential bid rigging when simultaneous bids for similar goods are asked from oligopolists. It appears that calling for similar bids simultaneously may incentivise collusion among bidders, while arranging several consecutive procurement auctions could lessen that problem. Moreover, simultaneous procurement auctions may result in a relatively high cost of supply due to the larger risks involved for bidders. Furthermore, bid rigging remains difficult to detect under simultaneous procurement auctions due to a large degree of uncertainty for bidders, which supports relatively high bid prices that may, in fact, be collusive.

Keywords: bid rigging, collusion, oligopoly, umbrella pricing, simultaneous procurement auctions

1. Introduction

Procurement of goods through the invitation of competitive bids remains a widely used practice for both governments and companies. Under bid rigging or collusive tendering potential bidders agree in advance which of them will offer the winning bid or the only bid. Collusive tendering can take place for both small and large contracts, and it can occur both in private and public procurement in a variety of industries, making it a significant issue of concern. Since collusion requires collaboration between companies, markets with fewer players, such as oligopolies, are often more prone to bid rigging practices than markets with a larger number of participants.

When bid rigging impacts a procurement, it may lead to suboptimal prices and thus have an adverse effect on the profitability of the purchaser. Moreover, collusive tendering practices distort competition and may pose threats to the financial soundness and survival of both honest competitors as well as procurers. For these reasons bid rigging is a *per se* violation in many countries under both public procurement and competition law and in some countries it is declared a criminal offence, investigated and sanctioned under criminal law.

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Different aims may motivate suppliers to engage in bid rigging. One of these is bid suppression, meaning that parties involved in bid rigging may wish to achieve a relatively high winning bid price so that only one of the parties submits a bid while others agree to refrain from bidding or to withdraw already submitted bids, usually for some reward. The reward can be in the form of the bid suppressing party being engaged as subcontractor to the successful bidder to provide part of the goods to the winner. In practice, it is difficult if not impossible to detect if a subcontractor of the winner could potentially have been an independent bidder and as such provide competition to the winner. In general, public procurement rules – for example, in the European Union (EU) the Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement – do not prohibit bidders to engage competitors as sub-contractors. In the EU, Article 57(4)d) of the Public Procurement Directive merely states that a contracting authority may exclude from participation in a procurement procedure any bidder with regard to which the contracting authority has sufficiently plausible indications to conclude that the bidder has entered into agreements with other economic operators aimed at distorting competition. Companies must observe competition law rules when collaborating with competitors, e.g. when preparing and submitting a joint tender. In the EU this means mainly Article 101 (1) of the Treaty on the Functioning of the EU. Even though in joint tendering competitors cooperate and exchange sensitive information, joint tendering does not yet mean collusive tendering, provided the cooperation is manifested in a joint tender being submitted. The main difference between a joint bid and bid rigging is that the prior is an openly declared activity whereas the latter usually remains a secret. There are however grey areas as it is, for example, not clear how to qualify from the competition law point of view a situation where competitors cooperate with the aim of submitting a joint bid, but just before submitting one decide to go with separate bids (refer to Graells, 2015 for further aspects).

In a more complicated case, the conspirators may agree to submit cover bids that are intended not to be successful with the aim that the designated winner can win the bid. Cover bidding, also called shadow, courtesy or symbolic bidding, aims to make the appearance as if real competition is taking place. However, the bids made by the colluders are either higher than the bid of the agreed winner

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or exceed the estimated budget of the procurer or intentionally contain conditions not acceptable to the purchaser.

In a tender process, the procurer usually aims at choosing the best supplier whereas the rest of the bidders will not be awarded with a contract. The winner-takes-all setting may thus inspire competitors to rotate the bids or allocate markets. In bid rotation the competitors agree upon a certain winning pattern among them over the course of many consecutive bids, and under market allocation the competitors have divided the market so that a certain supplier would win bids of a particular type or that some bidders win in certain geographic territories or among certain customers.

In addition to the above practices, collusive tendering can also take the form of bribery of contracting authorities or communication with other tenderers (Zarkada-Fraser and Skitmore, 2000). The latter one is particularly challenging not only for the competitors but also for the investigators, since not every innocent exchange of information qualifies as collusion under competition law rules.

The common feature of all these and other bid rigging practices is that by predetermining the winning bid they do not have to truly compete with each other. Bid rigging often remains difficult to detect and sufficient evidence for legal proceedings is hard to gather. In many cases, detecting collusion represents a purely legal investigation into agreements and other forms of communication between suspected bidders. Often the only possibility to reveal a procurement cartel and collect relevant evidence is through whistleblowing (Luz and Spagnolo, 2017) as was, for example, the case in 2002 when a major collusion case in the Dutch construction industry was discovered (Doree, 2004). Several authors have however searched for quantitative bid rigging detection techniques, including Porter and Zona (1993), Bajari and Ye (2003), Porter (2005) and Shan et al. (2018).

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This paper seeks to look into collusive tendering in simultaneous calls for bids under oligopoly, a case which has not received much attention in literature. Simultaneous procurement auctions represent a situation where the party seeking to purchase some goods, splits the procurement volume into slots, and calls for several bids for similar goods simultaneously, as opposed to asking for the bids consecutively one by one. Calling for simultaneous bids is a common practice in the EU member states, including in public procurement, e.g. in the procurement of similar services for different geographical areas or different organisational units. A key rationale for making simultaneous calls for bids appears to be a regular, e.g. annual, timing of procurement driven by the financial or budgeting cycle in the procuring organisation. Also, it has been advocated that splitting large-scale procurements into smaller parts may attract additional competition – refer to e.g. OECD Guidelines for Fighting Bid Rigging in Public Procurement and recitals 78 and 79 of Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement. The EU procurement rules very much propagate dividing bigger contracts into lots, whereas it is up to the contracting authority to decide if to use consecutive or simultaneous auctions. What makes simultaneous procurement special is that as competitors often face capacity constraints and as they are subject to economies of scale considerations the total procurement volume of simultaneous calls for bids may exceed the total capacity an individual supplier is ready to cover. The bidders thus need to consider an additional aspect in their bidding strategy – how to make the bids so that in case of winning their total capacity constraints and economic breakpoint levels would be properly addressed, and at the same time, their profits would be maximised. Seeking to address these uncertainties, suppliers may be motivated to engage in collusion.

The smaller the number of competitors in the industry, the easier for them to establish and maintain an efficient cartel. Oligopolistic markets may be particularly vulnerable due to the combined effect of a small number of market participants as well as capacity constraints of individual companies. That is why the paper is focused on the specific case of bid rigging in simultaneous sealed-bid procurement auctions under oligopoly. The paper is focussed on the economics and competition law perspectives of collusion rather than procedural public procurement matters (e.g. rejection of

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bids in case of bid rigging as a conflict of interests). Following the literature overview, Section 3 of the paper presents a conceptual argumentation for understanding the drivers of bid rigging under such circumstances, and Section 4 provides a discussion of the results.

2. Literature

Several authors have sought to provide a theoretical platform for understanding efficiency of procurement under oligopoly and related bid rigging considerations. Feuerstein (2005) and Weishaar (2013) provide a comprehensive overview of related studies. In one of the first papers on the topic, Friedman (1971) considers a Cournot oligopoly, and demonstrates that joint profit maximisation strategies work better than individual ones. Later theoretical studies bring out further aspects that make oligopolies particularly vulnerable to collusion. Shapiro (1989), van den Berg and Bos (2017), among others, explains that overall, bid rigging is more likely to occur under a small number of suppliers, whereas many suppliers would make a long-term cartel difficult to operate and coordinate. Selten (1973) and Phlips (1995) find that if few competitors enter or are likely to enter a market due to entry barriers and existing market participants are thus protected from the competitive pressure posed by any new entrants, there is a higher risk of (long-term) collusion to occur. New entrants and any other changes on the supply side (e.g. mergers, as discussed by Compte et al., 2002) are believed to make any ongoing bid rigging agreements vulnerable, while stability on the market increases the risk of collusion. It has been argued by several authors (see Scherer and Ross, 1990 for an overview) that the more homogeneous the procured goods are, the larger the possibilities for collusion among competitors. A similarity in products and cost structures makes competitors' profit maximisation strategies and procurers' preferences relatively easy to comprehend, and thus arrive at (long-term) agreements on mutually beneficial cooperation.

With regard to the effect of capacity constraints on collusion, there are mixed results in the theoretical literature. Brock and Scheinkman (1985) find the role of capacity constraints on potential collusion to be different for large and small bidders, with the latter being less exposed to

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the adverse effects of defecting from cartel agreements. Davidson and Deneckere (1990) demonstrate that increases in collusively agreed prices are positively related to increases in the level of (excess) capacity, as market players use the additional resources gained from collusion to expand their capacity with the purpose of earning even more profits (see also Paha, 2017 and Escrihuela-Villar and Gutiérrez-Hita, 2018).

While most of the above theoretical studies address one-off auctions, Jofre-Bonet and Pesendorfer (2003) suggest a methodology for the estimation of the outcomes of repeated procurement auctions with capacity constraints. The Jofre-Bonet and Pesendorfer (2003) study is important in the context of the current paper, as they model consecutive procurement auctions, which is the most likely alternative to simultaneous procurement auctions. They show two distinct effects which may be equally relevant under simultaneous auctions. First, they show that as a result of winning of a large contract some resources of the bidder may be committed for fulfilling that contract and although additional resources could be rented, this may increase total cost and thus disadvantage the bidder compared to competitors. Second, they show an experience effect considering that rendering services under one contract may provide the bidder new knowledge for fulfilling other similar contracts and thus lower the cost for future contracts. In addition to the theoretical argumentation, Jofre-Bonet and Pesendorfer (2003) find on empirical data on the US highway construction procurements that capacity constraints do affect bidding strategies of companies.

Aoyagi (2003) studies repeated sales auctions, finding that collaboration over multiple consecutive auctions gives a better payoff for bidders in comparison to a collusion over one auction. However, his paper does not address the effects of simultaneous nor reverse (i.e. procurement) auctions. Several authors have studied simultaneous auctions, e.g. Gunay and Meng (2012), Brusco and Lopomo (2009), and Engelbrecht-Wiggans and Kahn (2005), but from the sales auction perspective and mostly in the context of simultaneous ascending auctions, which differ in principle from simultaneous sealed-bid purchase auctions studied in this paper. Lundberg (2005) appears to be the only author to date to discuss simultaneous procurement auctions. She presents an interesting bidding strategy model, showing that such a purchase auction type motivates

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aggressive bidding, and provides results of its empirical testing. Her paper, however, does not cover bid rigging issues.

Previous empirical studies have primarily sought to quantify the effects and efficiency of procurement auctions and bid rigging on the examples of specific cases and industries. For example, Flambard and Perrigne (2006) have studied the procurement of snow removal services in Canada, finding among other results that differences in the distance of a service provider from the area to be serviced causes differences in suppliers' bidding strategies. Pesendorfer (2000) seeks to detect potential collusion in school milk procurement auctions in the USA. He shows that the informational asymmetry among market participants as a result of a cartel tends to lead to a pre-selected cartel member being the successful bidder, whereas non-cartel market players are less likely to achieve success in their less informed position. Chotibhongs and Arditi (2012) use cost structure and bid distribution testing in detecting potential bid rigging in construction sector on US data. Yakovlev et al. (2016) study the incentive mechanisms in repeated contracts on the example of gasoline procurement in Russia, while other recent country specific studies include, for example, Gani (2017), Scheffler et al. (2016) and Balaeva and Yakovlev (2017).

It is important to understand the broader economic context and effects of inefficiencies related to bid rigging. Economic fluctuations may change the investment and business strategies of companies due to changes in demand and availability of funding, having an effect on the incentives of market participants to engage in collusive activities as a last resort for survival. Rotemberg and Saloner (1986), Bagwell and Staiger (1997) and Nie (2017) consider the effects of economic fluctuations on collusion, finding, in general, that incentives for collusion are higher during periods of economic uncertainty, while competitors seek to regain losses with gains from bid rigging and other forms of collusion. Furthermore, effectiveness of regulations and broader institutional framework is key in sustaining economic development under the fierce global competition, and institutional conditions aimed at avoiding bid rigging and other market distorting practices represent important opportunities to support viability of businesses under bidding market efficiency (Klemperer, 2007; Van Siclen, 2010; Williams, 2014). Institutional inefficiencies

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relating to bid rigging may thus have much broader implications than the financial results of a particular bidder and procurer, and may provide market participants an unhealthy possibility to seek competitive advantages instead of finding ways to improve productivity and innovate in the use of intellectual and physical capital.

3. Conceptual argumentation

This section seeks to present a conceptual argumentation for understanding the specific features of simultaneous sealed-bid procurement auctions and their effects on potential bid rigging and outcomes of the auctions. The conceptual framework builds on the comparison of simultaneous and consecutive procurement auctions as the main alternatives in practice. We do not provide a comprehensive model of the behaviour of the bidders, but focus on some of its important characteristic features under simultaneous procurement auctions.

3.1. Simultaneous auctions and competition

First, it is important to understand the effect of simultaneous auctions on the number of interested bidders. As pointed out in Section 2, the smaller the number of bidders, the higher the risk of bid rigging or another form of collusion tends to be. If potential bidders were of different size, they would face different levels of capacity constraints. It is evident that the higher the procurement volume, the lower the number of bidders who would be able to submit their bid, while those bidders for whom the procurement volume remains above their capacity constraint would refrain from bidding, and at best they could act as subcontractors in a bid. In this sense, it appears reasonable to split larger procurements into smaller parts to enhance competition, as suggested for example in the OECD Guidelines for Fighting Bid Rigging in Public Procurement and in the EU regulatory framework discussed in Section 1.

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Considering, however, that larger market participants tend to have more favourable scale effects over their smaller competitors enabling them to offer better prices in both split and unsplit procurements, the claimed effect of splitting a procurement volume to support smaller businesses may be purely populist. Another path of argumentation on split procurement volumes as a support to smaller businesses would be that suppliers constrained with limited capacity could outsource additional resources to be able to bid for larger procurements. Assuming an oligopoly, the potential resource providers would be the other limited market players. It would be unlikely under market participants' profit maximising behaviour that smaller market players would be successful with bids where resources outsourced from their competitors would be used, while even a marginal mark-up would make their bid unattractive compared to the bid of the competitor, whose resources would be potentially outsourced. An additional counter argument is in the legal limits on outsourcing. For example, a bidder may not be allowed to propose a bid and at the same time act as a joint bidder or sub-contractor for another bidder. Thus, even if the competitors would agree on a scheme to overcome the capacity constraint, legality and applicability of such arrangement may be questionable. For these reasons, neither allowing participation of smaller suppliers nor outsourcing of additional resources by them would not have an effect on the bid results in practice, if other features of the bidders (including access to information) are similar and if lowest price is the selection criterion.

3.2. Simultaneous auctions and bid prices

Second, the effects of the simultaneous arrangement of the auctions on bid prices need to be understood. The most important difference under simultaneous bidding is that the use of combinatorial bidding is excluded, i.e. a bid under the simultaneous auction cannot be conditional on the outcome of any other of the simultaneous auctions or any other of the simultaneous bids. Consequently, as opposed to consecutive bids, the bids submitted simultaneously are independent from each other.

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Such a situation may give a false impression of being counter-collusive, meaning that the smaller the possibility to bid in consideration of other bids or previous auctions, the smaller the chances for bid rigging or another collusion among the bidders may seem to be. The fact that the bids are submitted independently of each other does not mean that the consequences of suppression of combinatorial bidding would not be considered when submitting the simultaneous bids.

Simultaneous auctions create a significant uncertainty for bidders about the possibility to achieve sufficient economies of scale. It is evident that costs would be a key input for a bidder when calculating what the profit maximising bid should be. Leaving aside any special circumstances, bidding below cost or exactly at cost would not be a rational behaviour as no profit would be generated.

Assume for simplicity that the goods procured under the simultaneous auctions are identical. Under uncertainty about the outcome of any of the simultaneous auctions, it would therefore not be rational for a bidder to submit any of the bids below the price that corresponds to the unit cost of supplying the procured goods in the volume called for in that individual auction, assuming no volume from any of the other simultaneous auctions. If the bidder would assume in its price offer scale effects from winning more than one auctions, but it would be successful with one bid only, supplying under the procurement would generate losses for the bidder. This is illustrated in Figure 1. Given the average cost curve *AC*, which represent economies of scale conditional on volume, it would not be rational to bid below the level of *AC* under any volume. If the volume procured under one of the auctions would be v_1, it would be rational to bid a price p_1 or above. If the volume procured under another of the simultaneous auctions is v_2, it would be rational to bid a price of above p_2 for that auction. Should the bidder win just one of the auctions, the supplying would not generate losses.

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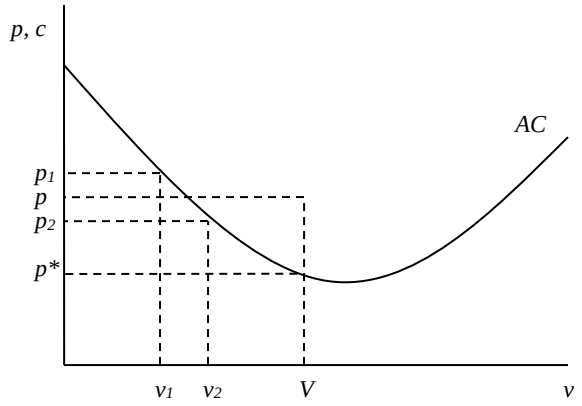
Figure 1. Economies of scale and rational minimum bids



However, if the bidder would win more than one bid, the total volume of supplies would enable him to earn a total mark-up in excess of the market return for supplying the goods in such a volume. Looking at Figure 1, should the bidder win both auctions, the total volume supplied would be $V = v_1 + v_2$. The break-even point corresponding to V would be p^*, but as the bidder has been successful with both of the individual bids, it can earn an average price of p or even above, meaning an above the market profit of $(p - p^*)V$. It is evident that the same pattern would repeat if there would be more than two auctions arranged simultaneously.

Normally, bidding at above market rates would diminish the chances of being successful with the bids – the larger the mark-up the less likely the bid will win. However, if all the competitors would follow a similar rational and loss-avoiding bidding strategy, such above market returns could be successful. In other words, if the profit maximising bidders would compete, as usual, based on the trade-off between the higher profits from bidding a higher price and the higher likelihood of winning the bid with a lower price and none of the bidders would tolerate losses, successful bidders would have a possibility to earn above the market profits. It becomes therefore clear that under such circumstances information about competitors' bidding strategies becomes especially valuable for each bidder. We will discuss these matters in Section 3.4.

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It is also interesting to note the differences in bid prices under simultaneous, consecutive and unsplit procurement auctions, if bidders would follow the above profit maximising and no-losses bidding strategy. Looking at Figure 1, if auction 2 would be arranged after the outcome of auction 1 becomes known to the bidders, bid prices for auction 2 would be dependent on success in auction 1. Should the bidder be successful in auction 1, it would need to bid a price above p^* in auction 2 to guarantee that no losses would be made. This means that in the case of consecutive auctions, a successful bidder could earn above the market profits in auction 1 only, totalling $(p - p^*)v_1$. The same pattern would repeat if there were more than two auctions arranged consecutively. The bidder that wins the first bid would have a competitive advantage over other bidders in the following auctions, as it can enjoy the benefits from economies of scale. This may lead to wins in all the consecutive auctions if other bidders would not change their bidding strategy.

If the procurement volume would be unsplit and the bids for the entire procurement volume would be called together, bidders would place their bids in correspondence with the total volume procured. On the example illustrated on Figure 1, the bidder would act rationally if it would bid at least price p^* for total procurement volume V. No above-market profits emerging just from the manner of organising the procurement would be available in that case. However, as discussed in Section 3.1., the potentially lower number of bidders may have an adverse impact on bid prices as well as potentially motivate collusion.

A further aspect to consider is umbrella pricing (Blair and Maurer, 1982; Inderst et al., 2014) meaning that a dominant company or a cartel creates an umbrella of usually artificially elevated prices above the market price. To be successful in the bid, small companies or companies not belonging to the cartel would need to bid a price below the umbrella price. Whether a non-colluding bidder can place a profitable and executable bid at less than the umbrella price depends on its size as both scale effects and capacity constraints in fulfilling the contract pose limits to the bidder. Under these scale effects or capacity constraints – which the umbrella price setter is often aware of under an oligopolistic market – total volume of demand by the customers would push the price up to the umbrella price and the smaller bidders are pushed out. Consecutive auctions would

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enable the small companies or companies not part of the conspiracy to adjust their pricing strategy based on earlier auctions and thus make a bid at below the umbrella price, making the umbrella pricing strategy ineffective.

3.3. Simultaneous auctions and capacity constraints

Third, we need to understand the effect of capacity constraints under simultaneous procurement auctions. In the case of nonsimultaneous (i.e. consecutive) auctions, a bidder would consider that if it would be successful in the auction, it would have less capacity available to participate in any future auctions up to the completion of the procurement won. The cheapest bidder would be successful in the first auction. If the cheapest bidder would be capacity constrained, it might not be able to participate in some future bids. This means that more expensive bids would have chances of winning later auctions. Being successful in future auctions may, therefore, enable the bidder to earn higher profits than in an earlier auction. The less capacity the bidder has available when a project is being bid, the higher the likelihood that winning this bid will preclude it from winning a later, more profitable procurement auction.

As explained in Section 3.2., under simultaneous procurement auctions bids cannot be conditional on the outcome of any other of the simultaneous auctions or any other of the simultaneous bids. This means that in addition to the uncertainties discussed in the previous section, when submitting a bid, a capacity constrained bidder would not know about competition in any of the auctions, i.e. which bidders would submit bids for which auctions and at which prices.

Assume each bidder to use Bayes-Nash equilibrium bidding strategies so that they aim to maximise their expected profits while considering all the available information about the other potential bidders. We can also assume, similarly to Bajari and Ye (2003), that the costs of the bidder for executing similar projects are asymmetrical, and that the bidders are aware of these differences in costs. The reason for asymmetrical costs may be related, for example, to the different

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locations of the bidders resulting in different transportation costs. Consequently, capacity constrained bidders would expectedly bid for these auctions where they have competitive advantages over some or all the other bidders, while they cannot bid in all auctions. This is fundamentally different from a consecutive auction setting, as discussed above, where capacity constrained bidders would make their decisions on whether to participate and what to bid based on the results of previous auctions. As a result, leaving aside some special cases, there would be a smaller number of bids submitted under simultaneous procurement auctions in comparison to consecutive ones. However, capacity constrained bidders may be motivated to submit bids for these auctions where their cost driven chances of winning are highest, and this should coincide with the auctioneer's objective of achieving best possible price in each auction.

If capacity constrained bidders have similar cost structures and thus limited asymmetries, it gives extra motivation to engage in bid rigging. Similar cost structures would mean similar profit maximising strategies making it easier to coordinate any cartel agreements.

3.4. Simultaneous auctions and bid rigging

As discussed in Section 3.2., under simultaneous procurement auctions, information about competitors' bidding strategies becomes especially valuable for each bidder in order to address the economies of scale considerations. The motivation for bidders to engage in bid rigging builds on the wish to be more certain about the volume of procurement that would be allocated to each individual bidder, to assess individual break-even points and consequently design their profit maximising bidding strategies.

If the bidders would co-operate and engage in bid rigging, it appears that all the conspirators would be better off, as long as each of them would be allocated more than one of the procurement slots auctioned. If any of the bidders would know that it would be allocated at least two slots, it would gain a competitive advantage over a non-cartel member so that it could bid prices even marginally

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below the average cost level that corresponds to the volume of an individual slot of the procurement, and therefore earn a profit.

Moreover, if such a cartel would be formed where every participant is envisaged to win at least two procurement slots, the cartel members could provide more competitive bids than any non-collusive bidders, provided there are no significant cost asymmetries with the bidders outside the cartel. If a bidder would know that it would win more than one slot, such a bid price for each slot that would guarantee profitability would be lower than the price that such a bidder would need to bid who has no information about the allocation of procurement slots. The collusive bidder could bid marginally below the non-collusive bidder's expected bid price, and secure a success. At the same time, the bid to guarantee success would enable the corrupt bidder to earn (potentially large) profits above the market mark-up level.

It follows from the above argumentation that in case of no capacity constraints, two companies would be enough to form an efficient cartel. In case of capacity constraints, the number of members should be sufficient to cover the entire procurement volume in all the simultaneously organised auctions. However, a small number of cartel members may pose a threat that another cartel or cartels could be formed. In this sense, a larger cartel would be more efficient. The optimal number of cartel members depends on the cost structures, capacity constraints and the total number of bidders. If the number of market participants is large, such a cartel would be difficult to operate efficiently and that is why oligopolies are more exposed to potential bid rigging.

Bid rigging would remain more complicated to detect under simultaneous procurement auctions. It appears from Section 3.2. that it would be natural to expect bidders to bid prices which correspond to the average cost levels at volumes of the individual auctions. This gives a reasonable justification for relatively high bid prices, while such prices may actually be collusive. It would be difficult to distinguish the bids submitted by honest competitors in light of the uncertainties surrounding the volume of procurement to be allocated to them from collusive bids that reflect the

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price levels carefully calculated in consideration of the market allocation agreements between conspirators.

4. Discussion

As suggested by game theory and as discussed e.g. by Bajari and Summers (2002), cartels are unstable by their nature, as every individual cartel member would be better off by breaking the cartel agreement and bidding for a larger number of auctions or at a lower price than agreed. In case all cartel members would break the agreement, all would be worse off however. It follows from the argumentation in Section 3.4. that in the case of simultaneous procurement auctions, the motivation of bidders to cooperate is particularly strong, especially under oligopoly. Furthermore, the duration of a cartel has a limited significance, as the entire procurement volume is auctioned simultaneously. However, because of the difficulties in monitoring whether the cartel agreement is being adhered to by all members, the likelihood of one or more of the parties breaking the cartel agreement are higher, but this does not necessarily mean that the auction results are as favourable for the auctioneer as under fair competition.

The motivation of bidders to collude depends on the way how the total procurement volume is split into individual auctions. If the splitting does not follow the patterns in bidders' competitive advantages, their uncertainties about the behaviour of other bidders and of the auction outcome are bigger, and thus the motivation to engage in bid rigging would be higher. Also, if the individual auctions are of similar volumes, the risks of bid rigging may be higher as it makes the allocation of parts of the procurement easier for bidders.

We have assumed so far that the simultaneous bids are organised as a sealed-bid procurement auction, meaning that when submitting their bids individual competitors are not aware of the others' bids. In practice, this assumption may not hold true if another type of fraudulent activity occurs and one or more of the bidders become aware of the bids submitted by others before

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submitting their own. This would result in informational asymmetries among bidders, giving the one(s) possessing information about other's behaviour immense advantages (refer to Hendricks and Porter, 1988; and Hendricks et al., 1994). If procurement is conducted by way of simultaneous auctions, the adverse effects of potential fraudulent informational asymmetries would be more serious than in the case of consecutive auctions, where tests of potential informational asymmetries could be conducted after each auction.

Even though the increase of market price for the relevant goods seems an inevitable result of bid rigging, it is not only the higher profits that motivate the companies to collude (Doree, 2004). Studies on a major collusion in the Dutch construction industry detected in 2002 revealed that conspirators appreciated highly the stable and predictable market environment created by collusion. According to the members of that cartel, the collusion made their business less vulnerable to predatory pricing and helped to avoid winner's curse whereby bidders accidentally or deliberately make an offer that does not enable them to cover their actual costs, and it allowed them to reduce the uncertainties regarding future workload.

On the one hand, there is a growing trend of aggregating and centralising of public purchases across the EU with the aim to benefit from economies of scale leading to lower procurement prices and lower transaction costs. On the other hand, contracting authorities are recommended to monitor the aggregation and centralisation of purchases to avoid excessive concentration of purchasing power and tender collusion. Excessive aggregation and centralisation are considered to create a serious entry barrier to small and medium-sized companies. But the same can happen if the contracting authority chooses a procurement strategy that does not consider the structure and specifics of the market. As shown in this paper, simultaneous auctions may not be the best strategy for oligopolistic markets, as uncertainties and lack of transparency may encourage dominant companies to collude.

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For a positive end note, as the total purchase volume under simultaneous procurement auctions is larger than the individual volumes of consecutive auctions would be, breaking a cartel agreement to enjoy the relatively large short-term gains from cheating by being successful on more auctions than agreed is more attractive than in the case of consecutive auctions where the short-term gains for the defector would be smaller. This is of course not an argument in support of simultaneous auctions.

5. Conclusion

A simultaneous procurement auction occurs when a party seeking to purchase some goods splits the purchase volume into several slots and calls for bids for each of the slots simultaneously, as opposed to asking for the bids consecutively one by one. Calling for simultaneous bids appears to be a common practice in the EU member states as well as in the OECD countries as it has been advocated that splitting large scale procurements into smaller parts may attract additional competition.

The unique contribution of this paper is the conceptual argumentation revealing that calling for similar bids simultaneously may give extra motivation for collusion among bidders, while arranging several consecutive procurement auctions could be a better alternative to reduce the potential for bid rigging. Moreover, simultaneous procurement auctions may result in a relatively high cost of supply due to larger uncertainties for the bidders, motivating in turn collusion between potential bidders. Consecutive auctions provide more transparency as the competitors can consider the conditions of the winning bid in one slot when competing for the next slot. Also, consecutive auctions provide bidders with a possibility to plan on capacity and scale effects, and not run into capacity constraints. On the other hand, consecutive auctions may be technically more challenging and time-consuming for the contracting authority to arrange than simultaneous procurement.

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The paper presents important managerial implications. Choice of the auction method and awareness of the supply market structure is as crucial for a good outcome of a procurement as the right award criteria. A contracting authority, especially with a stable and predictable demand, arranging simultaneous sealed-bid procurement auctions with lowest price as the main award criteria, may easily create temptation to collude for oligopolistic market players in order to reduce uncertainties exceeding the fear of possible disclosure and consequences thereof. As the paper is limited to conceptual argumentation, future research directions may include empirical studies on related matters.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No. 734712.

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