**Corruption in public procurement auctions with endogenous entry**

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**Abstract**

Corruption could change significantly the outcome of the public reforms. In this paper we examine how change in entry costs affects procurement prices in the corrupt environment. We introduce procurer as a separate player with his interests in the model of selective entry and find that decrease in entry costs reduces the contract price paid by non-corrupt procurer, but at the same time could make corruption more stable. This model explains why expected results of reforms focused on reduction of entry costs are usually overestimated.

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*Keywords:* auctions with endogenous entry; corruption; public procurement

**Коррупция и аукционы с эндогенным входом в государственных закупках**

Коррупция может существенно изменить результаты проводимых реформ. В данной статье мы рассматриваем, как изменение издержек участия влияет на цены государственных контрактов в коррупционной среде. Возможно ли снижение цен только за счет снижения издержек участия? Мы строим модель селективного входа, где заказчик действует как игрок со своими интересами. Согласно модели, снижение издержек участия снизит цену у некоррумпированного заказчика, однако влияние на цену у коррумпированного заказчика будет неоднозначным. Модель позволяет объяснить причины расхождения ожиданий от реформ с их результатами.

**Extended Abstract**

Entry barriers define market structure, the level of competition, the monopoly power of each firm and so on. Although barriers are more wide spread in some markets, all procurement “markets” have them. Firms face two types of barriers entering the procurement auction generated by the restrictions of the particular procedure and the complexity of the whole procurement system. In our model the former type of barriers reflects requirements set by public procurers, while the latter type is modeled through entry costs, which each firm incurs to enter a public procurement auction. For instance, a firm has to fill out an application form, submit technical documentation, provide an auctioneer with all the necessary information and finally make a bid. These entry costs are similar to all firms and, if high, prevent firms from entering public procurement leading potentially to public waste.

We focus on the procurement of standardized goods for which the procurer could easily specify most of the contract characteristics in advance and set a reserve price. It is goods where search characteristics dominate, while quality and innovation issues do not play a crucial role. For example – gasoline purchases, salt, sugar and some other simple services and goods. In such markets firms can estimate their costs before entering the auction. We suppose that a firm knows her production costs before entering the auction and base our paper on the model of selective entry following ideas of Samuelson (1985). The other famous model of endogenous entry [Levin & Smith 1994] presumes that a firm learns her private production costs after the auction is organized. Despite this difference in assumptions, these models agree upon an idea that lower entry costs do not always decrease the contract price.

Corruption is one more problem in the public procurement, which may go hand in hand with high entry barriers. Corruption practices are wide-spread in different countries, both developed and developing (Auriol, Straub, and Flochel, 2016; Lambsdorff, 2002; Di Tella, Schargrodsky, 2003). The majority of empirical and theoretical papers show that the corruption in the public procurement leads to higher contract prices (Arozamena, Weinschelbaum, 2009; Bandiera, Prat, and Valletti, 2009; Mironov, Zhuravskaya, 2016).

In this paper we examine whether lower entry costs decrease contract prices in procurement auctions in a corrupt environment. Modeling corruption, we capture the idea that the procurer should balance several interests: fulfilling of his obligations to delivery certain service to citizens, minimizing costs in order to show his supervisors that he is efficient, and extracting rents if he is corrupt. Each procurer has the ability to set contract terms restricting the entry of bidders so only some firms in the market meet them and can enter the auction. This could be reasonable both for non-corrupt and corrupt procurers, but only corrupt procurers ask for a bribe as the price of such a restriction. That raises the issue that non-corrupt actions may look similar to corruption and lead to the same results.

We demonstrate that an exogenous shift in entry costs, e.g. due to e-procurement reform, may lead to opposite changes in prices paid by non-corrupt and corrupt procurers. Even if lower entry costs negatively affect the contract price paid by a non-corrupt procurer, the contract price paid by the corrupt procurer may change in different directions depending on the initial size of entry costs and the magnitude of their decline. If initial entry costs remain high even after a decrease, the bidder cannot give a bribe; hence, this change decreases the price paid by the corrupt procurer as well as the price paid by the non-corrupt procurer. However, if initial entry costs are high and then drop dramatically, the contract price paid by the corrupt procurer increases and becomes equal to the maximum reserve price in the auction. A negative link between entry costs and the bribe is the driving force for this change. The lower entry costs are, the higher the bribe a procurer can extract, so the more attractive corruption is.

Our results are robust to changes in various assumptions, e.g. introducing penalties for the corrupt deal and increasing the number of preferred bidders.

Since e-procurement reform becomes more and more popular in many countries worldwide, the theoretical results of our model may be used for the identification of potentially non-corrupt and corrupt procurers on the basis of how their contract prices change after the reform. This practical application makes our study close to the work of Bandiera, Prat, and Valletti (2009), which separate procurement inefficiency and corruption analyzing public procurement reform in Italy.

## *. Case-study of Russian gasoline procurement*

In 2011 the Russian government introduced e-procurement reform, which is a perfect example of entry costs’ decrease. New electronic auctions were organized online on e-platforms replacing the prior outcry auctions, which were organized in public offices. The only difference between outcry auctions and e-auctions was the size of entry costs, mainly, paperwork and transport costs needed for participation, while other factors (e.g. the rules of setting the reserve price and choosing the winner) remained unchanged. In terms of the proposed model, the shift from one auction format to the other one lowered only the entry costs of bidders. We examine how this reform influenced entry and procurement prices depending on whether the procurer restricted free entry or not. Although it is questionable to point to corruption without the information of side payments, one can easily observe procurement outcomes of different strategies and use them as proxies for inner incentives of public procurers.

The Federal Law 94-FL “On public procurement” strictly regulated the procurement process in 2008-2013. The majority of simple products were purchased through two procedures: open-bid auctions and sealed-bid auctions. Both of them were standard first-price auctions started from the open reserve price. Open-bid auctions were considered as a priority procurement procedure and sealed-bid auctions - as an extra one. A procurer could not legally set any requirements on the reputation of bidders, but might vary contract requirements.

Public procurement of gasoline through gas stations best suits the purpose of our analysis. First, gasoline is a homogenous product, and gasoline delivered via gas stations has the same quality level in the public procurement and the private market. Hence, differences in contract prices reflect the public waste caused by procurer’s actions (the rent-seeking behavior or the incompetence) rather than the quality difference[[3]](#footnote-3). Second, a typical project of a gasoline public contract is clearly organized. It contains information about the subject of the contract (volume and types of gasoline), the expected contract duration and different requirements to potential bidders. Such a well-organized structure makes possible to indicate objective criteria of restrictive contract terms. We examine gasoline procurement in one Russian region – Nizhegorodskaya oblast (hereinafter NO) in 2008-2013. The high transparency of the regional public procurement web-site (Balsevich et al. 2011) and a sufficient number of gasoline public auctions determined our choice of the region.

A typical public contract on gasoline contains the subject (types and volumes of gasoline), the duration of the supply and other requirements. We identify several ways of restricting entry based on auction documentation: the number of districts of Nizhniy Novgorod (hereinafter NN) and NO where gasoline stations are situated, the delivery of a large volume of gasoline and the requirement of owning gasoline stations. Since only limited number of bidders satisfies each these criteria, their usage restricts entry. For instance, two firms have gasoline stations in 8 districts of NN, five firms have gasoline stations in 6 districts of NN, and six firms have gasoline districts in 4 districts of NN. So the more districts a procurer includes into the auction documentation, the fewer potential firms may enter the auction. If a procurer demands the delivery of a large volume of gasoline (e.g. above the mean), small gasoline firms cannot supply it, because they may be out of gasoline during the contract execution. And if a procurer requires a bidder to own all stations delivering gasoline according to the contract, a firm cannot use outsourcing; hence, small and medium firms cannot enter the auction.

**Table 1**

**Summary statistics on restrictions in open-bid auctions**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Group of auctions** | **NO** | | | **Procurer 1** | **Procurer 2** |
| **Mean** | **Minimum** | **Maximum** |
| **Districts of NN** | 4.884 | 0 | 8 | 7.852 | 0 |
| (3.895) |  |  | (0.770) | (0) |
| **Districts of NO** | 26.295 | 0 | 51 | 40.222 | 8 |
| (18.994) |  |  | (3.896) | (17.856) |
| **Delivery of gasoline\*** | 1.281 | 0.002 | 16.122 | 3.964 | 0.3 |
| (2.541) |  |  | (5.055) | (0.207) |
| **Owned gasoline stations** | 0.792 | 0 | 1 | 0.963 | 0.724 |
| (0.407) |  |  | (0.192) | (0.455) |
| **Restriction index** | 2.850 | 0 | 4 | 3.667 | 1.276 |
| (1.152) |  |  | (0.480) | (0.528) |
| **Obs.** | 173 | | | 27 | 29 |

*Note*. Standard deviations in parentheses.

\* tones per day, obs. 161

We simplify these types of restrictions to four dummy variables depending on whether a procurer chooses each of them: indicates one or more districts of NN and NO, demands the delivery of a large volume of gasoline and the delivery through owned gasoline stations. The answer “yes” stands for 1, while the answer “no” stands for 0. Then we summarize them and get a composite *restriction index*. The Table 1 presents summary statistics for the whole dataset (open-bid auctions before and after the reform) and two public procurers: the regional department of the interior (Procurer 1)[[4]](#footnote-4) and a big public hospital (Procurer 2)[[5]](#footnote-5), situated in NN close to each other. Two-group t-tests show that difference between restrictions used in open-bid auctions organized before and after the reform is insignificant. Meanwhile these restrictions vary a lot (standard deviations are high) and depend on the procurer organized an auction.

Table 1 shows that two selected procurers chose different restriction strategies, and further we focus on their auctions in more detail. Procurer 1 severely restricted entry using all of the considered ways, significantly more than average. Usually he indicated practically all (8 or 7.33 out of 8) districts of NN and 87-88% of districts of NO where gasoline stations must be located, required the delivery of a large volume of gasoline through owned gasoline stations. In contrast, Procurer 2 used restrictions significantly less than average. He demanded the presence of gasoline stations only in 15-20% of parts of NO and did not restrict the volume of gasoline significantly.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 2**  **Auctions organized by selected procurers: restrictions, entry and prices** | | | | |  |  |
|  | **Procurer 1** | | **Procurer 2** | |
| **Entry Costs** | **High** | **Low** | **High** | **Low** |
| **Restrict** | 3.5 | 3.8 | 1.188 | 1.385 |
| (0.522) | (0.414) | (0.403) | (0.650) |
| **Relative reserve price** | 0.995 | 1.030 | 1.065 | 1.011 |
|  | (0.051) | (0.046) | (0.062) | (0.025) |
| **Number of bidders** | 1 | 1 | 1 | 1.190 |
|  | (0) | (0) | (0) | (0.402) |
| **Relative contract price** | .995 | 1.029 | 1.058 | 1.000 |
|  | (0.051) | (0.046) | (0.067) | (0.029) |
| **Obs.** | 12 | 15 | 16 | 13 |

*Note*. Standard deviations in parentheses.

As predicted by the theoretical model, lowering entry costs did not stimulate entry when the procurer used many restrictions (see Table 2). Only one bidder entered into all auctions organized by Procurer 1. Contract prices were even higher than before e-procurement reform, as Procurer 1 chose a higher reserve price. Meanwhile more bidders enter auctions organized by Procurer 2, which led to lower contract prices.

This case study illustrates both main assumptions and the results of our theoretical model. First, in Russia public procurers can set strict contract terms, e.g. delivery terms, in order to prevent the entry of some companies into public procurement auctions, which results in higher contact prices. We define this behavior as restrictions of entry and incorporate it into the auction model. Second, a decrease in entry costs after e-procurement reform led to different changes depending on the behavior of public procurers. In case of Procurer 1 the reform had no effect on entry and increased contract prices, while in case of Procurer 2 the reform encouraged entry of more companies and decreased contract prices. This corresponds to the main result of the model: if lower entry costs reduce the contract price paid by a non-corrupt procurer, they may have opposite effect on the contract price paid by a corrupt one.

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3. Balsevich and Podkolzina (2014), Yakovlev et al. (2015) use these advantages of gasoline to study such topics, as corruption and repeated interactions between public procurers and suppliers. [↑](#footnote-ref-3)
4. ID 5260040766 [↑](#footnote-ref-4)
5. ID 5260048170 [↑](#footnote-ref-5)