

OBEGEF – Observatório de Economia e Gestão de Fraude

# WORKING PAPERS

#26

Corruption in Public  
Procurement: efficient and  
quasi-efficient



Andrey Ivanov



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Observatório de Economia  
e Gestão de Fraude

**>> FICHA TÉCNICA****CORRUPTION IN PUBLIC PROCUREMENT: EFFICIENT AND QUASI-EFFICIENT**

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## &gt;&gt; RESUMO

Na legislação sobre contratos públicos na Federação Russa os leilões são considerados o principal método de contratação. Tendo sido originalmente introduzidas as licitações presenciais, as autoridades russas foram forçadas a substituir estas por leilões electrónicos (e-leilões) devido à existência de demasiados casos de conluio. Contudo, os primeiros resultados da aplicação dos e-leilões revelaram, de forma inesperada, uma redução significativa na concorrência presente nos leilões.

Este trabalho argumenta que tal redução não pode ser explicada unicamente pelo comportamento corruptível da autoridade contratante mala fide ao tentar limitar a concorrência a favor dos fornecedores seleccionados em troca de subornos. Em causa está a hipótese do comportamento quasi-corruptível dos agentes compradores: a autoridade contratante bona fide tenta, também, limitar a concorrência a favor de determinados fornecedores mas com o intuito de evitar os riscos inerentes da aplicação do sistema britânico de leilões na compra de bens diferenciados.

**Palavras-chave:** Contratos públicos; corrupção em leilão; modelo do agente-principal; corrupção eficiente; corrupção quase-eficiente

## &gt;&gt; ABSTRACT

*In the public procurement legislation of the Russian Federation auctions are considered to be the primary procurement method. Having originally introduced live outcry auctions, the Russian authorities were forced to replace them with e-auctions due to many cases of collusion. However first results of applying of e-auctions unexpectedly revealed a significant reduction in the competition in the auctions.*

*The paper argues that this reduction cannot be explained only by corruptive behavior of the mala fide contracting authority trying to limit the competition in the favor of the selected supplier for kickbacks. The paper treats the hypothesis of buyer's quasi-corruptive behavior: the bona fide contracting authority is trying to limit the competition in the favor of the selected supplier too but for avoiding the risks which stems from the applying English auction for purchasing of the differentiated goods.*

**Keywords:** public procurement; corruption in auction; principal-agent model; efficient corruption; quasi-efficient corruption.

**>> INTRODUCTION**

The use of electronic auctions has been practiced in some States across the world. Brazil introduced the electronic auctions in the end of 2000 [Joya, L., Zamot, F., p. 4], the “Classical” directive [Directive 2004/18/EC, art. 54] provides legal certainty and specific rules and guidance for their application at European level since 2004, and, finally, they were introduced into the list of procurement methods by the new version of UNCITRAL Model Law on Procurement of Goods, Construction and Services (hereafter – Model Law) an year ago [UNCITRAL Model Law, art. 27].

The paper analyses the experience of the Russian Public Procurement reforms in the part of applying of electronic auctions which are considered to be now the main procurement method in Russian Federation (hereafter – RF).

Having introduced the live outcry English auction [McAfee, McMillan, p. 702] as the primary method of procurement in 2006 and having convinced in their own error three years later, the Russian legislators completely replaced it by the electronic auction.

As conceived by the legislator introducing e-auctions should give suppliers easier access to placing the orders, reduce corruption and prevent collusion, what, later, has to lead to increase the auction competitiveness and increase the size of the price reduction.

Before the introducing of e-auctions the dynamics of competition and price reductions in live auctions was as follow.

*Table 1. Live auctions performance<sup>1</sup>*

	2006	2007	2008	2009 <sup>2</sup>
Competition in the auction (bids/auction)	2.78	9.05	2.88	3.64
Average price reduction (%)	44.89	15.02	12.19	10.5 <sup>3</sup>

In 2010, the first year when e-auctions were applied on a large scale, there were 142450 auctions announced and carried out at three electronic trade platforms which were specially established in RF (hereafter – ETP):

<sup>1</sup> The data were presented at the XI International Academic Conference on Economic and Social Development (Moscow, Higher School of Economics, 6-8 April 2010) and published in the journal “Public Procurement” (Higher School of Economics) in Russian. – <http://conf.hse.ru/en/2010/programme>.

<sup>2</sup> By the end of first quarter

<sup>3</sup> By the end of third quarter

e-trading platform of the Republic of Tatarstan (<http://zakazrf.ru/>, hereafter – T-etp), Moscow e-trading platform (<http://roseltorg.ru/>, hereafter – M-etp), LLC «Sberbank – AST» e-trading platform (<http://www.sberbank-ast.ru/>, hereafter – S-etp).

Consider large-scale studies of the effectiveness of electronic auctions conducted by researchers of the Higher School of Economics (Moscow) in 2011<sup>1</sup>. Below we will use the statistics presented at the XII April International Academic Conference on Economic and Social Development (April 6, 2011)<sup>2</sup>. The researchers took a random sample of 32283 auctions in total at each of the three platforms.

*Table 2. Sampling size*

	M-etp	S-etp	T-etp	Total
Number of auctions	39885	84328	18237	142450
Sampling size	10916 (27.37%)	11732 (13.91%)	9635 (52.83%)	32283 (22.66%)

Data analysis revealed about the same results on any ETP.

*Table 3. E-auctions performance*

	M-etp	S-etp	T-etp	Total
Competition in the auction (second parts of bids <sup>3</sup> /auction)	1.5	1.6	1.8	1.6
The auctions are not to take place <sup>4</sup> (%)	75	69	71	72
Average price reduction (%)	6	4	4	4.7

Having compared data of tables 1 and 3 we cannot fail to notice that the competition is getting lower and correspondingly the price reduction is getting smaller.

Without loss of generality we can assume that in the course of transition from outcry auctions to e-auctions collusion problem cannot be sharpened.

<sup>1</sup> The Project Leader – Irina Kuznetsova, director of the Institute for State and Local Procurement Management of Higher School of Economics.

<sup>2</sup> <http://conf.hse.ru/en/2011/>. The findings of the survey have been published in the journal "Public Procurement" in Russian.

<sup>3</sup> There are two parts of every bid: first part describing the supplied goods, work or service (hereafter – goods) and second part describing the supplier. The second parts are considered just after the auctioning is over.

<sup>4</sup> There are many cases when RF public procurement legislation states that auction didn't take place. But in the any such case there was no competition in the auction.

So, we can conclude that the decline in the auctions' competitiveness from 3.64 in 2009 (Table 1) to 1.6 in 2010 (Table 3) had little to do with the conspiracy of suppliers but it was rather caused by corrupt behavior of the contracting authority<sup>1</sup>.

Below unless otherwise stated we will treat corruption as interactions the buyer and the supplier at the aim of giving and receiving kickbacks. However, it is not very easy to explain observed data by the corruption itself.

On the one hand there are no clear reasons for corruption to go up in the course of transition from outcry auctions to e-auctions.

On the other hand the data of Table 3 don't fit the other data on corruption level in RF. Really, let us consider some empirical data from the Business Environment and Enterprise Performance Survey (BEEPS), which is a joint initiative of the European Bank for Reconstruction and Development (EBRD) and the World Bank. These data indicate that the number of respondents who consider kickbacks as a part of the procurement process in RF has increased from 22% in 1999 to 28% in 2008-2009 [Yakovlev, Demidova, p. 3].

These figures indirectly confirmed by following data.

*Table 4. The answers distribution of the Heads of enterprises in the manufacturing industry to the question: "How often do enterprises of your industry have to give bribes or "kickbacks" to receive public or municipal orders?"*

	2005		2009	
	Number of firms	Sampling share (%)	Number of firms	Sampling share (%)
Practically always	87	87	87	87
Often	117	11.7	104	10.9
Sometimes	142	14.2	215	22.5
Never	366	36.5	338	35.3
Hard to respond	290	28.9	240	25.1
Total	1002	100	957	100

Source: [Yakovlev et al., 2010, p.11].

Obviously, these figures cannot explain why about 70% e-auctions didn't take place. Hence, we have to conclude that there is a something quite different from kickbacks.

<sup>1</sup> Hereafter terms "contracting authority", "public buyer" (and even "buyer"), "customer" are synonymous.

## >> METHODS

The natural starting point for modeling corruption in public procurement is a principal-agent model. Within its framework it is assumed that there are public needs, and in order to meet them the government (the principal) delegates a range of necessary activities on the procurement of goods to executive agencies or other public entities (the agent). Thus, the agent is endowed with discretion power and possesses a certain budget to carry out procurement.

There are some different models that can be developed in the framework of the principal-agent model.

Let us begin from the classical model in which a private individual attempts to corrupt a bureaucrat in order to obtain a government contract [Rose-Ackerman, p. 187]. In the framework of the classical model agent is considered as a potential 'bribee', and the actual level of corruption is determined by how well the institutions governing the (corruptible) bureaucracy are designed [Aidt, p. F635]. Thus, the initial hypotheses of the model are the assumptions about the integrity (benevolence, bona fides) of the principal and the agent's non-integrity (non-benevolence, mala fides).

In the classical principal-agent model politicians are supposed to make resource allocation decisions based solely upon the interests of their principal – populace. However, numerous examples of failures of government regulation [Jain, p. 73-74], [Roncarati, p. 20] make us to question the adequacy of this hypothesis.

Let us consider the model in which the principal is supposed mala fide. Having assumed the hypothesis, we have to transform the principal-agent (the government – the bureaucracy) model into the basic principal-principal-agent (the society (populace) – the government – the bureaucracy) model. In the resulting model the presumption of bona fides of the principal and the presumption mala fides of the agent disappears. So, we can consider two classes of models.

In the 'queue model' [Lui] and in the 'auction model' [Beck and Maher] corrupt bureaucrats try to correct pre-existing government failures. Thus, the initial hypotheses of the models are the assumptions about mala fides of the both: a principal and an agent. These models form the class of 'efficient corruption' models [Aidt, p. F633].

The paper completes the construction of the typology of principal-agent models, having introduced into consideration the model of 'efficient quasi-



corruption' based on assumptions of mala fides of the principal and bona fides of the agent (Table 5).

*Table 5. The Typology of the Principal-Agent Models*

Principal Agent	Mala fide	Bona fide
Mala fide	Efficient corruption	Classical model
Bona fide	Efficient quasi-corruption	

In the paper we propose to combine the institutions which are responsible for the development and implementation of public procurement policy (government, legislator, federal coordinator and monitor), under the name of principal. In turn, the entities acting as a buyer (regional centralized purchasing bodies, contracting authorities) will be understood as agents.

The Section "Results" is structured as follows.

We will start from the brief description of the public procurement reforms in RF. After that we will define who is the Principal and who is the Agent in the current public procurement system.

In the next part of the section we define terms "contract", "set of contracts", introduce agent's preference order on the set of contracts which coincide with the basic principal's preference order for bona fide customer. After that we model the introduced preferences by the indifference maps for the cases of procurement of homogeneous and differentiated goods, correspondingly.

Then, we consistently evaluate the risks of the English auction in the procurement of homogeneous and differentiated products.

The analysis of the model demonstrates that the English auction in the procurement of differentiated products does not allow the bona fide agent to behave rationally: choose the best contract from the contracts which is available to him (to say nothing of receiving of worst quality good from available ones). So, the principal is identified as mala fide: the resource allocation based on established regulation rules is inefficient.

In the section "Discussion" the following hypothesis is established and discussed. In the conditions of inefficient regulation in order to achieve his benevolent goals a bona fide public customer will demonstrate quasi-corruption behavior: appoint the favorite whose proposals are able to satisfy his needs in the best way, and will make great efforts to award the contract to the selected supplier.

Available statistics largely confirms the established hypothesis.

## >> RESULTS

### Development Stages of the Public Procurement System in the Russian Federation

By the present time the process of establishing the public procurement system of the RF could be divided into three stages.

The first stage (1992-1997). During this period, a lot of documents designed to be a legal framework of the public procurement were enacted. The first was Presidential Decree N 826 "On arrangements for the formation of the Federal Contract System" and the government resolution on its implementation. However, at this stage tenders for public contracts were not mandatory that is why there was a lot of corruption and the improvement of the legal framework was required.

The second stage (1997-2006). At those times the legal documents which had to become the basis for the formation of the modern public procurement regulation system were enacted: Presidential Decree N 826 "On urgent arrangements to prevent corruption and budget cuts in the organization of purchasing goods for public needs", Federal law N<sup>o</sup> 97-FL "On the organization of tenders for the procurement of goods, works and services for public needs". It should be noted that substantive provisions of these documents (first of all, the Presidential Decree N<sup>o</sup> 305) were based as was customary in international practice, on the Model Law.

In particular, it was allowed to use open and closed, one- and two-stage tenders, first-price sealed bid tender (requests for quotations), and open tendering was considered to be the primary procurement method. However, in contrast to the recommendations of the Model Law, legislative acts didn't provide the possibility of applying any kind of negotiation in the public procurement.

Moreover the above-mentioned legal documents left significant legal vacuum in the system of public procurement, their provisions hampered the creation of an adequate system of monitoring the public procurement process. It was reported that in 2004-2005 only 1% of public procurement contracts could be considered to be completely honest [McHenry W., Pryamonosov D., p. 216].

The third stage (2006 – present). The beginning of the next stage of national public procurement system formation was associated with enacting the "Law on Placement of Orders for Supplying Goods, Executing Works,

and Providing Services for State and Municipal Needs” (Federal Law N94-FL, hereafter – Federal Law or PPL).

They say that at least three conditions are necessary for corruption to arise and persist [Aidt, p. F633]:

1. Discretionary power: the relevant public official must possess the authority to design or administer regulations and policies in a discretionary manner.
2. Economic rents: the discretionary power must allow extraction of existing rents or creations of rents that can be extracted.
3. Weak institutions: there should be such incentives embodied in political, administrative and legal institutions that the officials are encouraged to exploit their discretionary power to extract or create rents.

Let us consider the major changes in the regulatory framework of public procurement of the RF related to the adoption of Federal Law in terms of their role in opposing to the realization of the above-mentioned conditions for corrupt behavior.

In order to limit the discretionary power of contracting authorities and to prevent them from rent-seeking

- extremely low price thresholds were established<sup>1</sup>;
- restricted tenders (except for the case when the procurement contains information regarded as state secret) and two-stage tenders were prohibited;
- negotiations procedures hadn't been allowed;
- qualification/reputation criteria were prohibited (later – were limited);
- there were no mechanism to reject abnormally low bids;
- reverse price auctions were selected as one of the preferred procurement method<sup>2</sup> mandatory for goods and services included in the special auction list (hereafter – Auction List).

Among the measures aimed at strengthening institutions, the following ones were offered:

- the uniform procurement law was introduced for all government levels: federal, regional, municipal;

<sup>1</sup> On January 1, 2006 Russia's price threshold was 78 times below the price threshold established by the EU for government bodies (€137000), at present (August 1, 2012) – 55 times below.

<sup>2</sup> Initially live outcry auctions could be applicable to any contracts, e-auctions – to small contracts only.

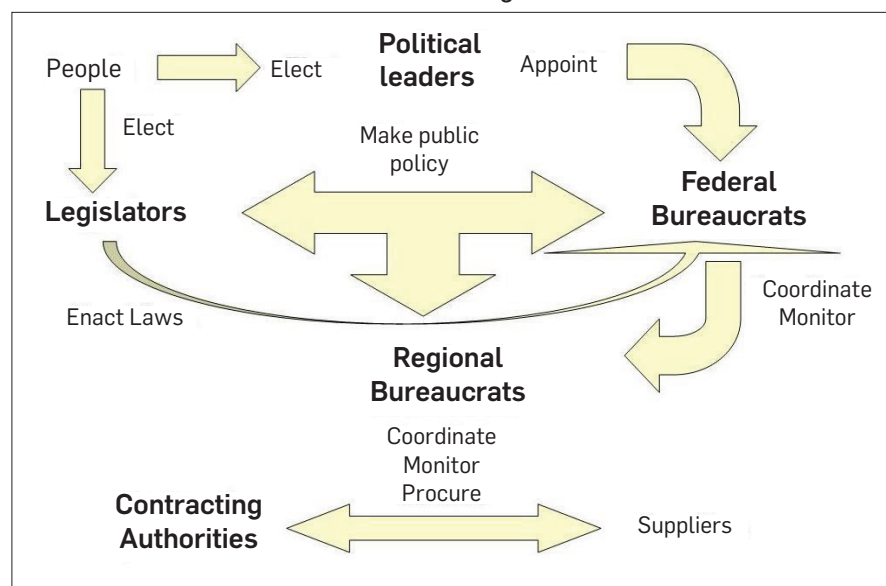
- the Ministry of Economic Development (Coordinator) was authorized to develop policy in the public procurement and the Federal Antimonopoly Service – to be a Monitor of the public procurement;
- the powerful information system was created and developed;
- severe penalties for violations in the public procurement were introduced;
- a temporary «embargo» for signing the contract based on the results of the tenders was introduced.

As a result, the Russian Federation developed a system of regulation of public procurement with political and legal elite, Coordinator and Monitor (the Principal), regional public procurement authorities and bodies governed by public law (the Agent). The difference among federal bureaucrats and regional ones is that the latter are authorized to purchase products.

To understand the mechanism of RF public procurement system, we consider its simplified model (Fig. 1):

- based on public discontent with corruption, political elite forms its request for the anti-corruption regulations,
- based on public discontent with corruption and established public policy, legislator takes an appropriate legislation,
- political elite appoints federal bureaucrats to implement the legislation,

*Figure 1. The simplified Model of the Russian Federation Public Procurement System*



- federal bureaucrats coordinate and monitor regional bureaucrats (there are 83 regions in the RF including two largest cities: Moscow and St. Petersburg),
- the last coordinate and control the relationships between contracting authorities and suppliers.

Thus, last six years in the field of public procurement Anti-Corruption Strategy based on a number of tools which before all are greatly limiting the discretion power of contracting authorities has been implemented. Nevertheless, the results of strategy implementation cannot be considered satisfactory: observed data point out to increasing the number and volume of a single-source procurement, reduction the competitiveness of the tenders and auctions, raising the level of corruption. RF public procurement system is going to enter the fourth stage of its evolution: a law on a Federal contract system is being developed.

### *Public buyer's preferences on the set of contracts*

Let us consider a contracting authority seeking to procure an indivisible good. Suppose that there are no reasons for single-source procurement. In this case, in accordance with Russian public procurement legislation, he can award a contract by the auction (open English e-auction – always, requests for quotations – for relatively small contracts) or by the open tender. Below, unless otherwise stated, we assume that an ex ante and ex post transaction costs are zero.

H1 (Hypothesis 1). The buyer is assumed to formalize the supplied good as a bundle of its specifications (for the simplicity reasons only, let us include into the bundle the time of delivery, volume and duration of the warranty, operation and, may be, utilization costs and so on) and to point out the feasible set for every specification:

$$x = (x_1, x_2, \dots, x_n), \quad x_i \in D_i, \quad i = 1, 2, \dots, n \quad (x \in D \subseteq D_1 \times D_2 \times \dots \times D_n), \\ x_i \in \tilde{D}_i \subseteq D_i, \quad i = 1, 2, \dots, n, \quad x \in \tilde{D} \subseteq \tilde{D}_1 \times \tilde{D}_2 \times \dots \times \tilde{D}_n.$$

In industries with a short life cycle of technology the adequacy of the hypothesis H1 is provided by carrying out multi-stage (possibly, negotiated) procurement procedures. Such procedures are provided by the international

procurement legislation [Model Law, art. 27, 1, e-h] and not provided by the Federal Law.

If the selection stage of an auction or tender gives the only bidder (hereafter terms suppliers, producers, sellers, bidders are synonymous) with  $x \in \tilde{D}$ , he must be awarded with a contract. Hence set can be called the set  $\tilde{D}$  of “quality goods” or simply quality set.

Consider the set of outcomes of the procurement procedure  $A = \{(x, p) \mid x \in D, p \in [0, +\infty)\}$ , where  $x$  is a formalized description of the supplied good and  $p$  is the price by which a contract is awarded<sup>1</sup>. We call the elements of the set  $A$  by the contracts and the set  $A$  by the set of contracts.

Denote by  $p_0$  the initial (maximum) contract price which according to the Russian legislation contracting authority should be included into the procurement notice. Consider the set  $\tilde{A} = \tilde{D} \times [0, p_0]$ , each point of which  $(x, p)$  – buyer’s feasible contract.

Suppose that on the set of contracts a preference order of the public buyer is defined. We put forward the following assumptions about its properties.

1. Reflexivity: A customer is indifferent between every two identical contracts.

Since the hypothesis H1 suggests that the bundle of good’s specifications contains all the specifications that are essential to the buyer, it is natural to assume that, by comparing the two contracts that match the content, terms and cost of delivery, he considers them as indifferent.

2. Completeness and transitivity.

Given assumptions 1-2, we have:

- from any finite number of contracts the public buyer is able to choose the best [Roberts],
- each feasible contract belongs to the definite set of indifferent contracts (indifference set of the contract), and indifference sets of contracts, which are not indifferent to each other, do not intersect.

For the reasons of simplicity and using the visual geometric interpretations let us agree to assume that the subject and conditions of purchase can

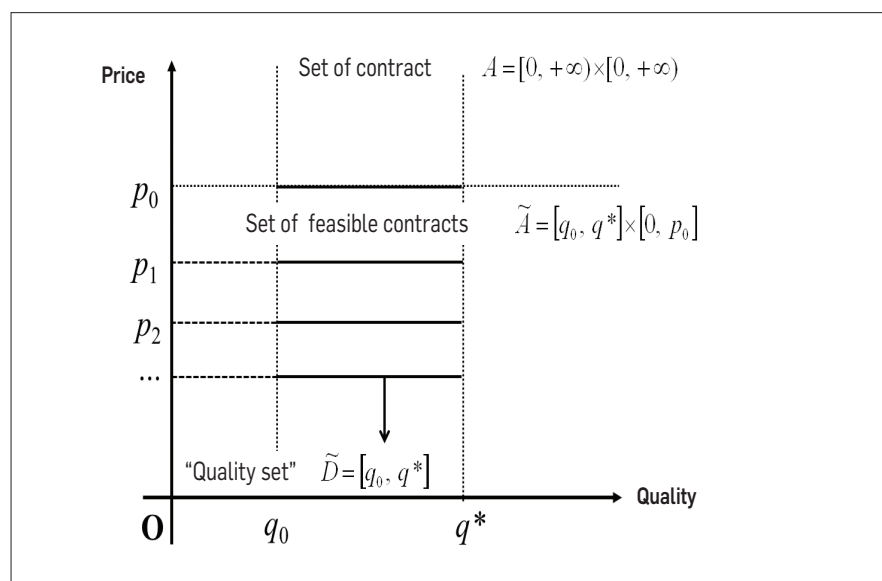
<sup>1</sup> The specific innovation of the Russian legislation with the possibility of achievement of negative prices in the auction (the transition to the auction for the right to deliver the goods free of charge) is not implemented into the model.

be expressed by the single numerical characteristic which represents the quality of supplier's bid and changing in a set  $[q_0, q^*]$ ,  $q^* \leq +\infty$ . In this case each indifference set does not contain interior points because the contracts differ in price characteristic (ceteris paribus) cannot be indifferent to each other. Hence, we can replace the term "indifference set" by the term "indifference curve".

Thus, given assumptions, the preferences of the public buyer on the set of contracts can be represented by his indifference map.

Consider the problem of procurement of a homogeneous product. In this case contracts which differ only in the value of qualitative characteristic, varying over a range of  $[q_0, q^*]$ ,  $q^* < +\infty$ , are considered to be indifferent to each other and indifference map looks like follow (Fig. 2).

*Figure 2. Public buyer's indifference map: procurement of a homogeneous product*



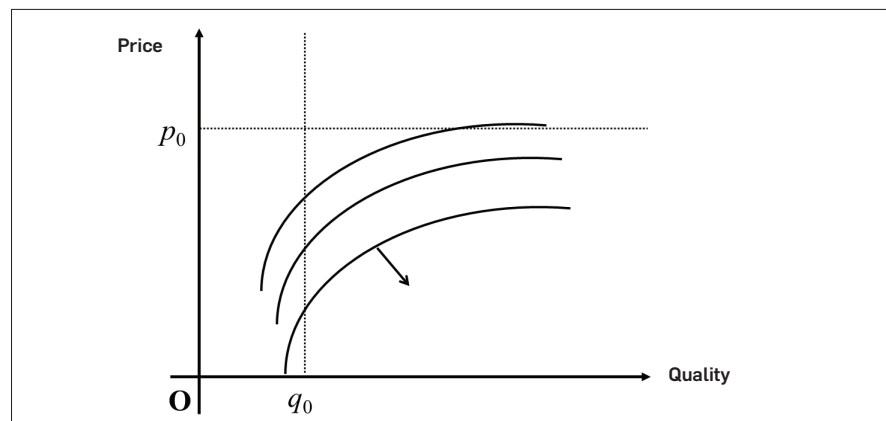
Consider the problem of procurement of a differentiated product. Without loss of generality, we may assume that the contracts with larger values of quality characteristic (ceteris paribus) are strictly preferable for the buyer.

### 3. Convexity.

Indeed, it is natural to assume that price changes for which the buyer compensates an equivalent manner consistent uniform increase in the value

of qualitative characteristic are non-increasing. In this case public buyer's indifference map looks like follow (Fig. 3).

*Figure 3. Public buyer's indifference map: procurement of a differentiated product*



It should be noted that the properties of smoothness and strict convexity of the buyer's preference order, in general, are not assumed.

In this case, if there are a finite number of different groups of suppliers producing goods of different quality (each group consists of producers of homogeneous products) then the buyer's preference order can be modeled by the family of piecewise constant no decreasing indifferent curves.

#### *English Auction in the Procurement: basic model*

Let us consider a contracting authority seeking to procure an indivisible good. We assume the following hypotheses.

H2. The public buyer is assumed to be bona fide: there is no favored supplier for him.

Let us suppose that the public customer defines a set of quality goods in such a way that there are  $N$  suppliers who can deliver the goods from this set:

$$x^i \in \tilde{D}, \quad i = 1, 2, \dots, N.$$

Note that the hypotheses of similar to hypotheses H1-H2 are not relevant for seller's auction.

H3. Each supplier knows what his own production and delivery costs will be if he wins a contract and this information is available to him only.



Hereafter we will denote by  $c_i$  the  $i$ -th supplier's economic costs of production (purchase price when buying from a producer) and delivery costs of the procured item (there is no participation cost):

$$c_i = C_i(x^i), \quad x^i \in \tilde{D}, \quad i = 1, \dots, N: \quad c_1 \leq c_2 \leq \dots \leq c_N.$$

For simplicity reasons, hereafter assume  $c_1 < c_2$ .

H4. There is no collusion among suppliers.

H5. There are no dumping suppliers (nobody bids lower his costs).

It is clear that the problem of abnormal price bids is specific for buyer's auction.

We will call the suppliers, for whom hypotheses H4 and H5 take place, bona fide suppliers.

H6. All suppliers are risk-neutral.

H7. The suppliers are symmetric: all the bidders appear to be the same to the buyer and to each other.

Let us assume that the purchased good is from the Auction list, hence, we cannot procure it by the tender, and the price of the contract is large enough, hence, we cannot procure it by the request for quotations.

Proposition 1 [McAfee, McMillan, p. 707]. If there is a contracting authority seeking to procure indivisible good by the English auction and hypotheses H1 – H7 take place, then the lowest-cost supplier will win the bidding, and the price of the contract will be equal to the costs of his last remaining rival.

### *The procurement of homogeneous product: risks of the auction mechanism*

Consider the problem of procurement of a homogeneous product. In this case the hypothesis H7 is obviously satisfied. We assume that there is a famous distribution  $F(\mu, \sigma)$  from which suppliers draw independently their costs.

In this case setting the initial price of the contract  $p_0$ , for example, close to  $\mu + 3\sigma$ , public buyer will provide sufficient competitive procurement: under natural assumptions in the auction will take part almost all potential suppliers. In turn, the fall in price during the auction, almost certainly, will not exceed  $6\sigma$ .

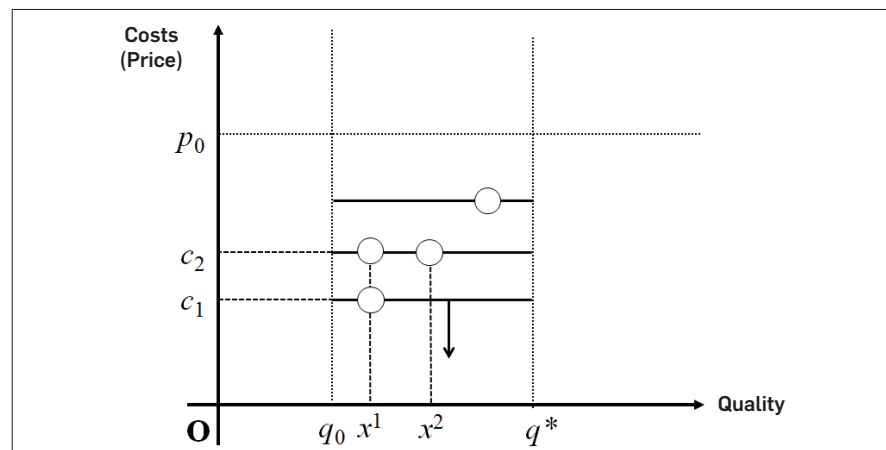
#### 1. «Second-price» risk.

The receiving of a sole bid or recognition of a single supplier as an auction participant is very unlikely in the procurement of homogeneous product. Let us suppose that  $N > 1$ .

Given assumptions, by means an English auction we will obtain the contract  $(x^1, c_2)$ , for which we have the following two relationships.

On the one hand, the contract  $(x^1, c_2)$ , obtained by means the English auction, is dominated since the first-price auction (Dutch auction, if it would be allowed by the PPL, or request for quotations) would allow the customer to obtain the strictly preferred contract  $(x^1, c_1)$  (Fig. 4).

Figure 4. The English Auction: awarded contract for purchasing of a homogeneous good



However, the specification of assumptions about the form of function  $F$ , a sufficiently competitive procurement on the considered market and a number of regulations for determining the initial contract price collectively make the risk estimation  $(c_2 - c_1)$  by means  $6\sigma$  substantially overestimated.

On the other hand, the contract awarded to supplier number 1 is strictly preferred to the contract with any supplier other than him (Fig. 4):

$$(x^1, c_2) \succeq (x^i, c_i) \quad \forall i \geq 2.$$

Consider the risks involved in the procurement of homogeneous goods and arising from the breaking of hypotheses adopted above. Let us suppose that hypotheses H1, H3, H6, H7 are true but the hypotheses H2, H4 and H5 can be violated.

## 2. The risk of a mala fide public buyer.

Here we assume that the contracting authority is mala fide (H2 is violated).

In the procurement of homogeneous goods the simultaneous implementation of the three conditions (discretionary power of the customer (A), the possibility of rent extracting (B) and weak institutions (C)), in which corruption can occur and supports [Aidt, p. F633], seems unlikely.

A. The public buyer unable to restrict competition by appointing a “favorite” and crafting specifications on the base of the favorite's bid.

A-B. To the public buyer is almost impossible to provide the favorite's surplus, setting the initial price of contract overestimated.

The value of the favorite's surplus, which can be shared between him and the customer, is uniformly bounded as follows:

$$p_0 - c_i \leq p_0 - c_1 \leq 6\sigma, \quad i = 1, 2, \dots, N,$$

and, as it stated above, this estimation is, in general, significantly overestimated.

C. Comparability of contracts for the supply of homogeneous products makes it easier the control over them.

### 3. The risks of mala fide suppliers.

The risk of mala fides of the suppliers, which concludes in their cooperative behavior (H4 is violated), also limited due to the bounded size of the favorite's surplus (1). Moreover, the bona fide customer is able to manage this risk by careful monitoring of prices and setting up the appropriate initial contract price.

If we have the only supplier who bids lower his costs, for example, the supplier number  $j$  (H5 is violated), the awarded contract is  $(x^j, c_1)$ , and it jeopardizes its implementation. However, the estimation of the difference between the costs of the supplier  $c_j$  and the contract price  $c_1$  by value  $6\sigma$ , generally speaking, may be less than the difference between his economic and accounting costs that enables the customer by the corresponding transaction costs make the proper execution of the contract.

If we have several suppliers who bids lower their costs, the estimation of the difference between the costs of the winning supplier and the contract price does not seem to be possible. In this case the winner of the auction is unlikely to be able to provide high-quality contract execution.

*The procurement of differentiated product: risks of the auction mechanism*

In this section we will consider the market where there are many sellers providing somewhat different products. Such products can be, for example, medical equipment, healthcare or educational services or something else.

Without loss of generality, we can assume that suppliers fall into two distinguishable different classes and buyers identify their products as the products of different quality: “high” quality (HQ) or “low” quality (LQ)<sup>1</sup>. For instance, sellers can be represented by international or domestic firms, public or private firms. Since we assumed that the ex ante transaction costs of the public buyer are zero, the goods, discussed in this section, may be classified as search goods [Nelson, p. 312].

In this case it is natural to assume that there is a preference order of the customer on the set of goods and for the bona fide customer the higher quality goods strictly preferred to lower ones.

H8. The higher quality products imply the higher production costs.

Given assumptions, the suppliers can no longer be considered as symmetric ones, and hypothesis H7 is violated. Moreover, there is a problem of adequacy of hypothesis H3 since every LQ-supplier knows that his costs are lower than the costs of every HQ-supplier (and vice-versa).

However, despite the available information about the costs advantages of LQ-suppliers, HQ-suppliers, generally speaking, may participate in the auction due to the mechanism of anonymity of participation.

Proposition 2 [McAfee, McMillan, p. 714]. If there is a contracting authority seeking to procure indivisible good by the English auction and hypotheses H1 – H6, H8 are true, then the worst-quality supplier wins the bidding, and the price of contract will be equal to the costs of his last remaining rival or to the initial price of the contract.

#### 1. The curse of «second-price».

The implementation into the practice of English e-auctions has shown that the risk of a single application for participation in the auction is large enough (Table 3).

Thus, if a single bidder is recognized as auction's participant then, instead of the contract  $(x^1, c_1)$  which under certain assumptions could be awarded on

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<sup>1</sup> However, the both types of producers supply the goods which belong to the quality set.

the base of the first-price auction or the open tender, a public buyer obtains the dominated contract  $(x^1, p_0): (x^1, c_1) \succ (x^1, p_0)$ .

Consider the factors influencing value of  $(p_0 - c_1)$ , which can be considered as a quantitative risk assessment of the customer.

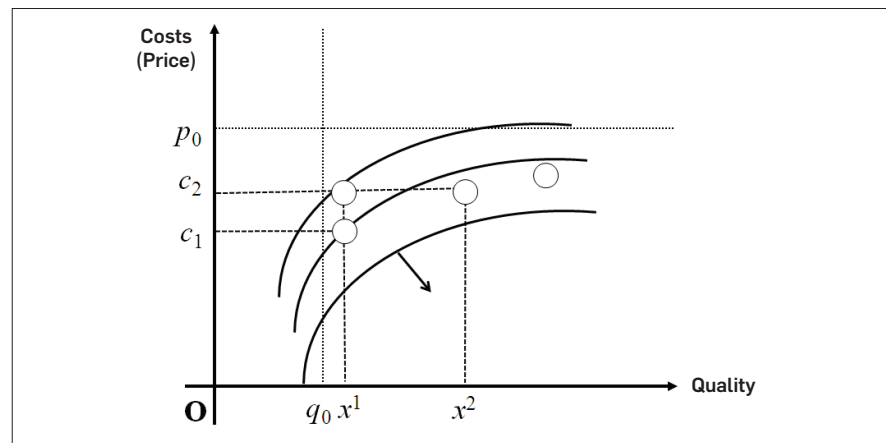
On the one hand, the risk is getting higher, if there are products of LQ-suppliers and HQ-suppliers in the quality set  $\bar{D}$  defined by the buyer.

On the other hand, the presence in the market public and private buyers (private and public health organizations, universities, etc.) at the same time, generally speaking, can contribute to a higher initial price of the contract even if customer is bona fide.

Let's assume that the participation in the auction allowed more than one supplier.

In this case the contract  $(x^1, c_2)$ , obtained by means of the English auction, is dominated by the contract  $(x^1, c_1): (x^1, c_1) \succ (x^1, c_2)$ . (Fig. 5).

Figure 5. The English Auction: awarded contract for purchasing of a differentiated good



## 2. The risk of irrational behavior.

Consider the problem of selecting the best contract from the contracts affordable to the buyer. It is clear that the English auction gives to the buyer the contract  $(x^1, c_2)$  which is dominated not only the contract  $(x^1, c_1)$  but the contract  $(x^2, c_2): (x^2, c_2) \succ (x^1, c_2)$  (Fig. 5).

Moreover, Fig. 5 shows that on the considered market the English auction gives to the buyer not only the worst good from the affordable goods but can give the worst "quality"- "price" combination from the affordable ones. Thus, we can establish a violation of the hypothesis of rational behavior: a bona fide

customer from a variety of alternatives available to him does not choose the most preferred.

### 3. The risk of the mala fide public buyer.

Here we assume that the buyer is mala fide: he has a favorite bidder. Consider the problem of implementation of the necessary conditions for corrupt behavior on the market in question.

#### A. Public customer is able to restrict competition as follows.

Firstly, he can craft a specification on the base of favorite's bid putting emphasis on performance features of a bid, if his favorite is HQ-supplier, and technical features, if his favorite is LQ-supplier.

Secondly, he can determine abnormal conditions of the contract implementation, first of all, the time of delivery.

Thirdly, he can restrict access to the procedure for the other suppliers by manipulating the procurement information.

#### B. Due to the fact that there are also private buyers on the considered market mala fide public buyer can increase the size of the potential transfer of money by choosing a favorite among the LQ-suppliers and justify overpriced contract.

#### C. The current regulation of public procurement in the Russian Federation based on the Federal law of direct action; it makes the contracting authority responsible for the compliance with PPL provisions, but not for the result of the purchase.

Accordingly, establishing an inflated price and leaving in auction the sole bidder the mala fide customer shares with him the extracted rent with impunity.

It should be noted that if the algorithm of mala fide public buyer's behavior is approximately the same in terms of the tender, and in terms of the auction, the probability of discover of such behavior is lower in the auction due to the shorter duration of the procedure.

### 4. The risks of mala fide suppliers.

Analysis of the problem of suppliers dumping and collusion in the procurement of differentiated goods coincides with the similar analysis conducted for

the case of homogeneous goods. The only difference is that the relevant quantitative risk assessment can no longer be regarded as sufficiently small.

Nevertheless, the analysis of the causes of anomalous quantity of failed e-auctions in 2010 indicates that the basis for this phenomenon is not so much a conspiracy of suppliers, as corruption or quasi-corrupt behavior of public customer [Ivanov].

#### 5. The risk of information transparency.

Despite the available information about the costs advantages of LQ-suppliers and the content of Proposition 2, HQ-suppliers can participate in the auction due to mechanism of its anonymity.

However, the availability of information on the participation of LQ-suppliers in the auction (violation of the hypothesis H3) precludes participation in the procedure for HQ-suppliers.

In this case the public procurement market risks becoming a market for lemons which is characterized by the products quality worsening and buyer's reserve price (initial price of contracts) declining [Akerlof], [Ivanov].

## >> DISCUSSION

The model developed in the previous section predicts that applying e-auctions will give us an increase in competition and, correspondingly, a significant price discounts most of all in the purchasing of differentiated goods.

Thus, available statistics largely doesn't confirm model's forecast: there is no competition in auctions, extremely high number of auctions hasn't taken place, and a price of contracts is very close to the initial price (Table 3).

Therefore, some of the assumptions which were established in the previous section are not true. Let us examine the consequences of relaxing the hypotheses of integrity: H2 and H4-H5.

Since the dumping behavior of suppliers does not imply an increase in the number of failed auctions (the H5 is violated), we start with the assumption that the suppliers cooperate to each other defining their own favorite (the H4 is violated).

The question is: how many auctions didn't take place due to collusion. It is rather difficult to answer this question outside the context of specific geographic and product markets [Albano, p. 347-380]. Nevertheless, as we state it above, decline in the auctions' competitiveness had little to do with the conspiracy of suppliers but it was rather caused by corrupt (or quasi-corrupt) behavior of the buyer.

Thus, we conclude that the unsatisfied performance of auctions is related to corrupt behavior of a public buyer (the H2 is violated).

As we noticed above the data on kickbacks in Russian public procurement system cannot explain why up to 70% e-auctions in 2010 didn't take place. Hence, we have to conclude that there is a room for corruption without kickbacks.

Below we will assume that the public buyer is bona fide and his preferences, defined on the set of contracts, coincide with the preferences of the basic principal.

The analysis has proved that the English auction in the procurement of differentiated products generates significant risks to the public buyer:

- gives him the worst quality goods from the affordable ones,
- the awarded contract is attributively dominated, and even there is a possibility to obtain worst contract from the affordable ones,
- the potential risk of mala fide supplier's behavior (dumping) is very likely,
- the HQ-suppliers can leave the market due to transparency information about the auction's participants.



So, the principal can be identified as mala fide: the resource allocation based on established regulation rules is inefficient.

In the conditions of the inefficient regulation it is natural to assume that in order to achieve his benevolent goals bona fide public customer will demonstrate quasi-corruption behavior: he will appoint the favorite whose proposals able to satisfy his needs in the best way, and make great efforts to award the contract to the selected supplier. It is worth noting that the methods, applied to both the bona and the mala fide public buyers to ensure success of their favorite, are about the same.

Nevertheless, the results of actions of bona and mala fide public buyers are fundamentally different: mala fide buyers are seeking to transform market into something like a “market for lemons” where goods of low quality are bought at high prices, bona fide buyers are seeking to transform market into something like a private market where goods of high quality are bought at high prices.

Thus, the paper has identified a significant number of risks associated with the use of the English auction in the procurement of differentiated goods. In these circumstances, decision to procure by the English auction shall be, in accordance with international practice, sanctioned by the authorized body [Model Law, art. 27-28]. Thus, any prescribed use of the English auction in the considered market does not seem appropriate.

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