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BASIC RESEARCH PROGRAM

WORKING PAPERS

SERIES: PUBLIC ADMINISTRATION

WP BRP 19/PA/2014

This Working Paper is an output of a research project implemented within NRU HSE's Annual Thematic Plan for Basic and Applied Research. Any opinions or claims contained in this Working Paper do not necessarily reflect the views of HSE.

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**THE EFFECTS OF REGULATORY REFORMS ON PUBLIC
PROCUREMENT: THE CASE OF A NATIONAL UNIVERSITY IN
RUSSIA⁵**

This paper analyses the impact of reform and different regulation regimes on the effectiveness of procurement at a large state university in the period from 2008 to 2012. We evaluate the impact on the procurement effectiveness parameters of two significant changes in the public procurement regulations: transfer to electronic auctions from 2010 under the Federal Law and the adoption by this organization of its own Procurement Provision from 2011. We show that transfer to electronic auctions leads to higher competition and more significant price decreases, whereas the adoption of Procurement provision has the opposite effect. Regarding delays in contract execution, the first reform has no effect and the second regulation change results in decreasing delays.

JEL Classification: H57.

Key words: public procurements, budget sector organizations, regulation, reforms, effectiveness.

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⁵ This paper has been prepared as part of the project “Comparative Analysis of Public Procurement Effectiveness”, supported by the Basic Research Program of the Higher School of Economics in 2014.

Introduction

Public procurement constitutes an important part of the national economy of both developed (European Commission 2008; Klemperer 2002) and developing countries (Dlamini and Ambe 2012) and are included in the sphere of their permanent control and analysis. This is connected with the fact that public procurements account for 10–15% of GDP for the first group of countries and even more for the second (Lewis and Bajari 2011; Ohashi 2009). On the other hand, public procurement can be used as an indirect mechanism for stimulating small and medium business development (European Commission 2008; PwC 2011; A. Yakovlev and Demidova 2012a) and introducing innovations (Aschhoff and Sofka 2009; Uyarra and Flanagan 2010; Rolfstam 2009). Therefore, efficient public procurement is an inseparable part of government regulation.

An important feature of public sector procurement both in Russia and in the United States and EU countries is their excessively rigid regulation compared to private sector procurements (HSE policy paper 2010; Tadelis 2012). This excess regulation is an unavoidable consequence of the enhanced risk of corruption for customer organizations officials (Büchner et al. 2008), favouritism (Laffont and Tirole 1991), third party opportunism (Moszoro and Spiller 2012), and results in ineffective and costly procurement procedures. A wide-scale survey of public procurement effectiveness in countries of the European Union conducted in 2011 and covering 5,500 state customers and 1,800 suppliers from 30 countries showed that procurement procedures in the private sector compared to the public sector are on the whole evaluated as more flexible and more efficient. At the same time, the level of competition at auctions is lower in the private sector (PwC 2011). One of the factors for this decrease in competition is supplier reputation being taken into account. It creates a certain degree of inequality among the bidders, but at the same time it is conducive to better immediate procurement outcomes and creates long-term incentives for new potential suppliers to join in the tender procedures (Spagnolo 2012). Another factor which enables private organizations to be more effective is fostering sustainable relationships with suppliers. This aspect is essential for high-tech goods, where quality is significant. Nevertheless, on this issue it is more effective to build relationships with suppliers, rather than to procure from one and the same supplier. For example, customers, who exploit competitive procedures among known suppliers with good reputations are more effective than customers, which procure directly from one and the same supplier (Coltman et al. 2009).

During the past decade many countries have demonstrated a tendency to make regulation of public procurement more flexible (see, e.g. (Spagnolo 2012)). One of the approaches to implementing such regulation is the extension of opportunities for negotiation (Chever and

Moore 2013) and creating autonomous and semi-autonomous organizations (Bandiera, Prat, and Valletti 2008; A. A. Yakovlev et al. 2013). At the same time, there is a tendency towards an increase in transparency of public procurement, which has a favourable effect on the efficiency of procurements in general (De Silva et al. 2008; Ohashi 2009; De Silva, Kosmopoulou, and Lamarche 2009; Podkolzina, Pivovarova, and Balsevich 2011). Special attention is paid to electronic procedures that help solve some significant issues: fighting corruption (Neupane, Soar, and Vaidya 2012), increasing price efficiency of procurement and competition, stimulating of IT development in public administration (Croom and Brandon-Jones 2005). Nevertheless, some countries imposed certain restrictions (both external structural barriers and internal customer incentives) that turned the introduction of electronic auctions into a complicated and lengthy process (Henriksen and Mahnke 2005; Wirtz, Lütje, and Schierz 2009).

In Russia the last years, they made some efforts to make public procurement more flexible and transparent. In the short term there were some steps towards this. From the middle 2010s, all federal-level customers are required to conduct auctions on electronic platforms. Later, this regulation was expanded to municipal-level customers. From the middle of 2011, for some public organizations with “autonomous” status it was established that their procurements shall not fall within the scope of Federal Law if the organization’s Supervisory Board adopted a special Provision regulating their procurements. Such Provisions were presumed to include procurement procedures and supplier selection mechanisms that take into account the specifics of a particular autonomous organization. For most large public organizations accepting “autonomous” status and adopting the Procurement Provision were an open option for them. The final step of the procurement reforms was the enforcement of the Contract System (44 Federal Law) from January 2014.

On the bases of procurement data of a large national university in Russia in 2008–2012 we estimate the impact of two important changes in the public procurement regulation system. The first of them is the transfer to electronic auctions in the middle of 2010 within the context of 94-FL regulation and, the second is the adoption of the university’s own Procurement Provision (in July 2011). Competition, relative price decrease in auctions, and delays in the execution of contractual obligations were chosen as procurement effectiveness parameters.

The article is presented in the following way: in section 1 we briefly describe the steps of procurement reforms in Russia; section 2 describes changes connected with the transfer to electronic auctions; section 3 discusses the principal changes caused by the adoption of the university’s own Procurement Provision; on the basis of these two institutional changes, section 4 formulates the basic hypotheses to be tested; section 5 contains a descriptive analysis of the

organization's procurement data for 2008–2012; section 6 formulates the methodology of econometric research; section 7 presents the results of regression analysis; in conclusion we present the main findings and economic policy recommendations.

1. Public procurement reforms in Russia

The 2005 reform of the public procurement system connected with the adoption of Federal Law 94-FL¹ was the first step in the regulation of public procurement in Russia. This reform was aimed at preventing abuses by officials and increasing competition during the selection of suppliers. These objectives have been emphasized many times in statements by government representatives and reports from the Federal Antimonopoly Service (Artemyev 2006; RFAS 2012). The tools used for attaining those objectives included rigid and very detailed regulation of governmental order placement procedures with a focus on the selection of suppliers on the basis of the lowest price criterion and the restriction of the use of any quality criteria for evaluating bids. The active introduction of the selection practice of suppliers through auctions was also supposed to boost competition. Electronic auctions have become obligatory for most public sector organizations since January 2011.

All these measures stimulated the growth of competition in the public procurement sphere but at the same time the analysis of the application of 94-FL demonstrated that it led to a shift of corruption to other stages of the procurement cycle (planning and delivery) and generated numerous problems in the fulfilment of contractual obligations (Tadelis 2012; HSE policy paper 2010). Subsequent more detailed empirical studies showed that the problems with the execution of contracts (delays in fulfilment of obligations or failure to fulfil them in full) occur more frequently in cases where the legislation restricts customers in applying qualification and business reputation criteria to the choice of suppliers (A. Yakovlev, Demidova, and Balaeva 2013). In the paper (A. Yakovlev and Demidova 2012b) it was also showed that before the reform of 2005, industrial enterprises partially owned by the state, old companies and large firms had preferential access to government contracts. In 2009, large firms retained this preferential access despite the stimulation of small and medium business development. Moreover, according to estimates the amount of kickbacks in 2009 was similar to before the 2005 reform. The active modernization of enterprises had no effect on their access to government contracts. The impact of electronic auctions both on problems with contract execution and on effectiveness of procurement procedures remained an open-ended question as far as 94-FL is concerned. An examination of this issue is one of the subjects of this work.

¹ 94 Federal Law “On Placement of Orders for Supply of Goods, Fulfilment of Works, Provision of Services for State and Municipal Needs”

Discussions concerning the consequences of 94-FL in Russia resulted in a critical reevaluation of approaches to procurement regulation. Specifically, the concept of the Contract System (44-FL) the law which since January 2014, envisages an extension of regulation on the contract planning and delivery stages with a simultaneous widening of the spectrum of procurement procedures which can be used by state customers. Considering the experience of 94-FL enforcement, it will presumably take a long time to reveal both the positive and negative aspects of the new legislation. Nevertheless, the impact of some elements of 44-FL can be studied now. Public sector reform in Russia was implemented in several stages (from 2006 to 2012). It envisaged the introduction of different types of public sector organizations, including public institutions and enterprises, state budget-funded agencies and autonomous organizations. According to the rules established for the latter type of public sector organizations, their procurements did not fall within the scope of 94-FL if the autonomous organization's Supervisory Board adopted a special Provision regulating their procurements. Such Provisions were presumed to include procurement procedures and supplier selection mechanisms that took into account the specifics of a particular autonomous organization. Moreover, for most large state budget-funded organizations acceptance of "autonomous" status and the adoption of the Procurement Provision were an open option.

Main differences between different types of public entities created within the framework of the budget sector reform

<i>Legal status</i>	<i>Sources of financing</i>	<i>Activities</i>	<i>Procurement regulation</i>
State-run entity / enterprise	State budget (according to expenditures estimate)	Prisons, some types of utilities, entities with control functions	94-FL
Budget-funded entity	Mostly the state budget with limited opportunities to earn money in the market	Schools, hospitals, universities, public libraries, museums	94-FL
Autonomous organization (AO)	Annual 'government order' for relevant services. No liability for government to cover all expenses of a public entity and to pay for its debts		AO can avoid the 94-FL rules if it has its own Procurement Provision adopted by its Supervisory Board

Such implementation of 44-FL elements provides a good opportunity for comparing the consequences of applying old and new public procurement regulations, which constitutes the second subject of this paper and builds upon the ideas presented in the work (A. A. Yakovlev et al. 2013).

2. Electronic Auctions – Implementation Goals and Stages

The electronic form of open auctions as one procurement method constitutes auctions conducted on specialized electronic trading platforms. According to the legislation¹ on state customers, the auction participant offering the lowest bid becomes the winner of the electronic auction for a state or municipal contract. This procurement procedure became obligatory for the federal state customers from 1 July 2010, and for regional and municipal customers from 1 January 2011². The electronic auction procedures are currently conducted for the entire range of goods (works, services) the orders for supply (fulfilment, provision) of which are placed through auctions.³

The struggle against collusions both among bidders and between bidders and customers during the process of procurement can be regarded as the underlying purpose of introducing electronic open auctions. Other considerations for transferring to electronic auctions include transparency and openness, raising competitiveness, ensuring budget savings, and reducing the costs of the auction procedures.

There are some fundamental differences between electronic auctions and open auctions conducted on trading platforms in real time. These include:

- Distance auctions at specialized electronic platforms;
- Multiple submission of electronic bids;
- Participation confidentiality regime;
- Legal confirmation of the customers' and auction winner's obligations based on an electronic digital signature;
- Minimum paperwork;
- Accessibility to representatives of small- and medium-sized business;
- Short period of the procedures.

On the whole, a conclusion can be made that electronic auctions provide greater trading opportunities for auction participants at the same time ensuring both a reduction of expenses for

¹ Federal Law No. 44-FL of 5 April 2013 "On the Contract System in State and Municipal Procurement of Goods, Works and Services," Art. 69 (10)

² Chapter 3.1. was adopted by Federal Law No. 93-FL of 8 May 2009

³ RF Government Order No. 2019-r of 31 October 2013

the preparation of relevant documents by public sector organizations and the relative increase of competition at the auctions conducted using this procedure.

The transition to this procedure was gradual and included three stages of the introduction of electronic auctions.

Stage I

A pilot list of goods, works and services for federal customers was in force from 1 January to 30 June 2010 (Government Order No. 1996-r of 17 December 2009) the contracts for which were concluded exclusively through electronic auctions. The list included such items as food, textiles, pharmaceuticals, construction jobs to the value up to 50 million rubles.¹ Government Resolution No. 755 identified three pilot electronic auction platforms: SUE Agency for Government Contract, Investment Activity, and Interregional Relations of the Republic of Tatarstan; OJSC United Electronic Market Place; and CJSC Sberbank Automated Trading System.

Stage II

Starting 1 July 2010, the list of produces for federal customers subject to procurement through electronic auction procedures was extended to cover the whole auction list approved by RF Government Order No. 236-r (over 60% of the range of commodities for government contracts). Therefore, the so-called “hammer” auctions were replaced by electronic auctions for federal organizations.

Stage III

Starting 1 January 2011, electronic auctions became obligatory, for the same total auction list, for regional and municipal customers as well.

As a result of the gradual transition, starting in 2011 the procurement of about 70% of the entire produce range for state and municipal needs had to be performed through open electronic auctions.

As a result of the competitive selection carried out by the Ministry of Economic Development jointly with the Russian Federation Antimonopoly Service on 20 November 2009, five electronic facility operators were granted the right to conduct electronic auctions for federal, regional and municipal customers:

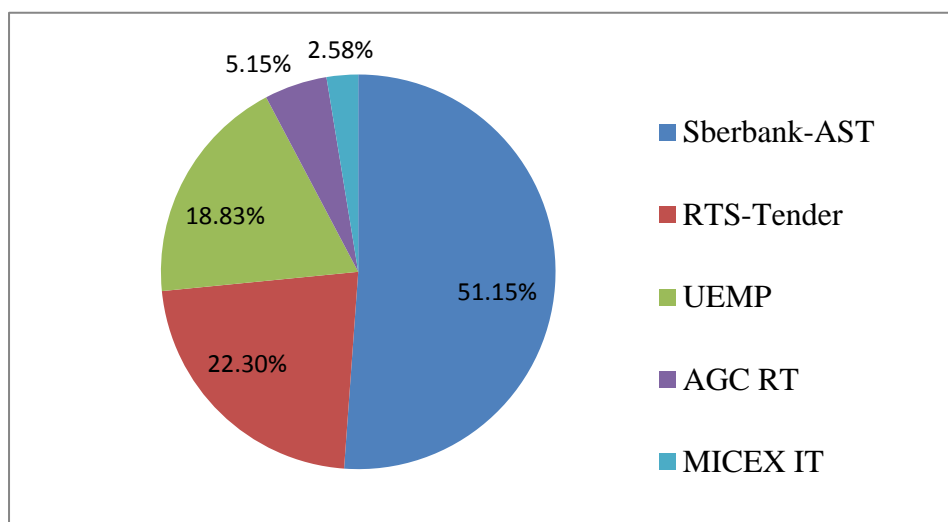
¹ RF Government Order No. 1996-r of 17 December 2009 “On the List of Goods, Works, Services the Placement of Orders for Respective Supplies, Fulfilment, Provision of which for Federal Needs is Performed by Open Electronic Auction from 1 January 2010 to 30 June 2010”

- SUE Agency for Government Contract, Investment Activity, and Interregional Relations of the Republic of Tatarstan – www.zakazrf.ru;
- OJSC United Electronic Market Place – www.roseltorg.ru;
- CJSC Sberbank – Automated Trading System – www.sberbank-ast.ru;
- CJSC MICEX – Information Technologies – www.ets-micex.ru;
- LLC RTS-Tender – www.rts-tender.ru.

From the moment the pilot project was launched and until today, Sberbank has been the largest trading platform accounting for over 50% of procurements made through electronic auctions. The latest data available on the distribution of contracts concluded by electronic auctions between different platforms are for 2013:

Figure 1

Distribution of contracts concluded among electronic platforms, %



Source: procurement portal: <http://zakupki.gov.ru/epz/main/public/home.html>

3. Procurement Rules and Procedures Prescribed by the Organization’s own Procurement Provision

In this article we examine the procurements of a large state national research university performed through auction procedures in the period from 2008 to 2012. Being an autonomous organization, it was making procurements in accordance with 94-FL until July 2011, but then it adopted and implemented its own Procurement Provision.

There is a whole number of fundamental differences in procurement regulations prescribed by 94-FL and the Procurement Provision of the organization under survey. These differences are

connected with the purposes of relevant reforms. 94-FL was designed to check corrupt conduct and collusion in the procurement sphere and simultaneously boost competition during the auctions and ensure subsequent budget savings, whereas the Procurement Provision had the principal target of high-quality execution of contracts with moderate competition and a reasonable reduction in prices during the auctions. Therefore, 94-FL actually provides for only four procurement methods (including tenders, open auctions (subsequently electronic ones), requests for quotations, and single-source contracting), whereas the Provision on Procurement of Goods, Works and Services envisages a wider choice of procurement methods and some changes in their application terms. They include the following procedures (including electronic ones): open single-stage tender; open single-stage tender with prior qualification; open two-stage tender; open tender with rebidding; open auction (including electronic ones); request for quotations; single-source contract with a supplier (executor, contractor), including direct contract; procurement under simplified procedures. After the adoption of the Procurement Provision procurements were made mostly through “hammer” auctions and eventually electronic auctions.

Compared to 94-FL, the Procurement Provision extends the possible grounds for single-source contracting. Along with the implementation of a set of procedures, more focus is made on the requirements for the supplier in order to raise the quality of fulfilment of contracts. Qualification requirements for suppliers were also introduced, including differentiation at the stages of bid submission and evaluation. Similar requirements were also set to sub-contractors of potential suppliers. The customer could require additional documents from suppliers for substantiating the submitted bid, verify them and, in the event of emergence of risks, dismiss the bid at any stage of its submission and verification. This restriction of competition aimed at the high-quality fulfilment of a contract for the supply of sophisticated goods has a theoretical base in (Bakos and Brynjolfsson 1992). The positive effect of using prior qualification for preventing collusion is demonstrated in (Calzolari and Spagnolo 2006).

Additionally, a number of procedures (e.g., open tenders, auctions, requests for quotations) set the following restrictions on dumping: if a contender’s bid contains an offer of a 25% decrease or more of the initial price established by the customer, then the contender must present a relevant substantiation. While this condition restricts price competition, it reduces the risk of concluding a contract with an incompetent supplier. Moreover, expert control over the substantiation of the initial prices by customer departments was introduced in some priority procurement areas (including construction projects, computer hardware procurements, security and fire alarm equipment), contributing to significant cost savings before the start of any competitive procedure.

Regarding the auction procedure there were the following changes of Procurement provision from 94-FL.

1. According to the Procurement provision the auction list of goods was settled by the head of the university. In the case of small procurement amounts it is permitted to use simpler and faster procedures for goods from this list (e.g. simplified procedure or requests for quotations). Moreover, there is no quarter total amount limitation on exploiting this procedure for any good.
2. There is the opportunity to change the initial contract value of procured good. Like in 94-FL, the Procurement provision permits increasing the value of good until the initial price of the auction (price per unit does not change and equals the contract price per unit). However, the Procurement provision allows changing the value of contract within 10% of contract price.
3. Regarding a cancellation of auction process, 94-FL allows the cancel of an auction no later than 10 days before the final date of application submission, whereas the Procurement provision does not restrict the auction rejection period.

Therefore, presumably, the adoption of the organization's own Procurement Provision should have an impact on the competitiveness of procurement procedures, and on the quality of contract execution. These assumptions will be confirmed in the analysis which follows.

3. Main Hypotheses

The analysis of changes dealing with the transfer to electronic trading platforms for conducting open auctions and changes concerned the with adoption of the Procurement Provision in organizations under consideration as compared to regulations envisaged by 94-FL lead to the formulation of the following hypotheses:

- I. Auction competition level.
 1. As mentioned, electronic auctions provide greater trading opportunities for bidders due to open access, common rules for all, and the minimization of bid submission costs. Therefore, we assume that the transfer to electronic open auction platforms will, on average, lead to an ***increase in competition at the auctions***. This means that the number of bidders will grow after the enactment of the law on obligatory use of electronic trading facilities.
 2. The autonomous institution's Procurement Provision introduces business reputation criteria and qualification for selecting suppliers. Therefore we assume that the transfer to the institution's own Procurement Provision would lead to a relative ***decrease of competition at the auction***.

II. Price decrease during the auction.

1. The transfer to electronic trading platforms made the bids of public sector organizations for supply of various goods publicly available and open. The bidder offering the lowest price, regardless of other criteria (e.g. reputation), is recognized as the auction winner. Therefore we assume that the transfer to electronic open auction platforms will, on average, result in ***a the growth of relative decrease of the initial price at the auction.***
2. To prevent “dumping,” the autonomous institution’s Procurement Provision introduces requirements for the supplier to provide additional substantiation of the capability execute the order with adequate quality in the event of a more than 25% price decrease compared to the starting price. Therefore we assume that after the organization transfers to its own Procurement Provision ***the price at the auction will decrease less significantly.*** In some procurement areas this may also be a consequence of the expert control of substantiation of starting prices by customer departments envisaged by in-house regulations of the organization under survey.

III. Problems during execution of contracts.

1. The absence of a business reputation criteria for supplier selection and the open nature of electronic auctions may result in ***increased problems in the execution of contracts*** after the transfer to electronic open auction platforms.
2. The wider use of qualification and business reputation criteria under Procurement Provision should lead to a reduction of problems in the execution of contracts and to the lowering of default risks under the contracts. Therefore we assume that after the adoption of the Procurement Provision ***the problems in the execution of contracts will decrease.***

Measuring the problems in the fulfilment of obligations is an individual task requiring detailed consideration. In this work, building upon the findings of (A. Yakovlev, Demidova, and Balaeva 2013; A. A. Yakovlev et al. 2013), we use delays in contract execution as the criterion of problems in the fulfilment of contracts. This criterion characterizes the execution problems only partially, but it is one of the few parameters that can be numerically assessed and to which econometric analysis can be applied.

2. Data for Analysis and the Main Procurement Parameters

The data used for this analysis includes contracts concluded by a large national research university both through open electronic and “hammer” auctions in 2008–2012. This information was provided in the form of electronic tables by the procurement department of the

organization, sanctioned by their superiors. At present procurement data from various public sector organizations in Russia, both at the stage of auctions and at the stage of delivery, are available on the portal zakupki.gov.ru. However, full information is presented only for procurements made after January 2011 and it is not available for autonomous organizations. Full micro-data on procurements of one large budget sector entity for the period 2008–2012 at our disposal will help us overcome these gaps.

The procurement information included the following initial data:

- contract placement method (open auction, electronic auction);
- auction number;
- contract subject;
- type of procured goods (works, services) based on the economic classification of budget expenditures;
- procurement budget (according to the pre-auction information card);
- number of bidders who applied for auction, including the number admitted bidders, as well as the number of bidders present at the auction;
- winner’s quoted bid;
- name of the supplier (executor, contractor);
- contract number;
- contract (agreement) conclusion date;
- contract (agreement) deadlines;
- information on actual payments under the contract (date and amount).

In addition to the existing classification of goods, works and services in the database, we also introduced another classification of procurements for purposes of further analysis based on the provisions of institutional economic theory. This classification includes “search goods,” “experience goods” and “credence goods” and results from objective differences in quality evaluation opportunities.¹

In addition, as the organization has adopted its own Procurement Provision, a relevant variable reflecting this event was entered in the database. A variable characterizing the transfer to electronic auctioning was also added.

¹ See (Nelson 1970) and (Darby and Karni 1973), and also (Tirole 1988). The quality characteristics of the first group of “search goods” can be set prior to the contract conclusion and checked at the point of delivery. Cement or stationery are examples of such goods. The quality characteristics of the second group of “experience goods” can be set before the conclusion of the contract, but generally they can be checked only at the time of consumption, i.e. after the contract has been concluded. Such goods include, e.g. food products or heating line repair jobs. Finally, the quality characteristics of the third group of “credence goods” often cannot be set by the customer independently even in the process of using the purchased goods, works and services and fulfillment of the contract. The evaluation of the quality of such goods generally requires special expert assessment. Examples of “credence goods” include medical or educational services. In accordance with this classification, different procurement procedures are recommended for different types of goods.

Taking into account the available empirical data characteristics, the effectiveness of procurements for the organization under consideration was measured along such parameters as competition at auctions and price decreases during the auction. The contract execution issue was measured as delays in the fulfilment of contractual obligations. Considering the restriction that the number of auction participants was not registered for open auctions in the period of 2008–2009, we used the number of accepted bidders as the competition measure.

The number of contracts concluded by the organization in 2008–2012 through open auctions varied. Most contracts were concluded in 2010, totalling 295 (see Table 1), whereas in 2012 there was 130. The total contract value demonstrated similar dynamics. The average value of one contract, in turn, varied from 3–4 million rubles from 2008 to 2011, but in 2012 the figure jumped up to nearly 5.9 million rubles.

Table 1

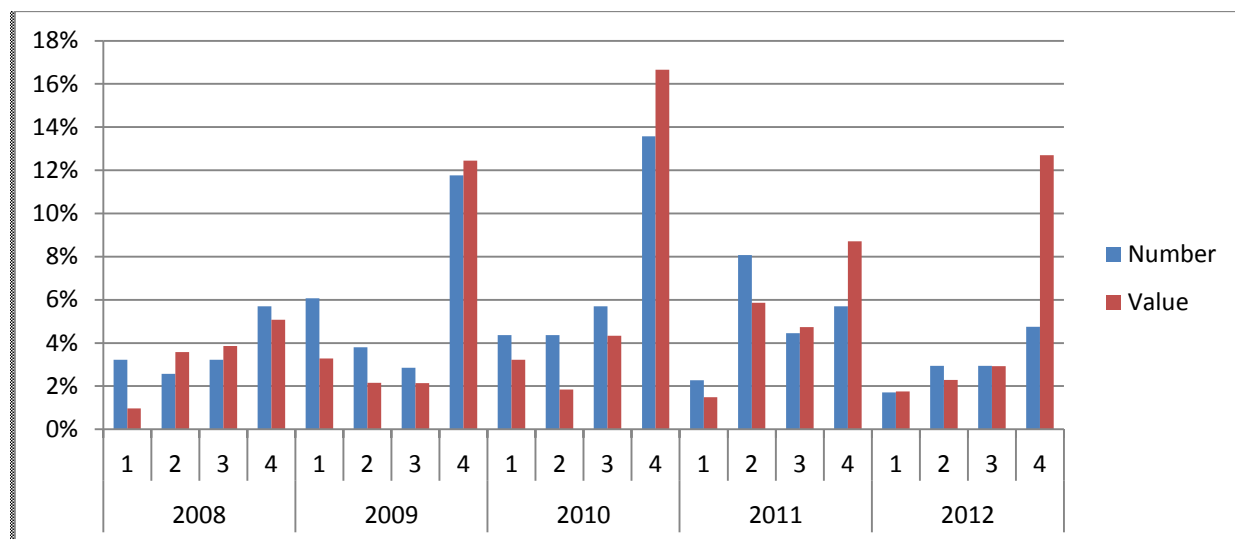
Number of contracts concluded through open auctions in 2008–2012 and their total value

Contract conclusion year	Number	Total value (RUR million)	Average value (RUR thousand)
2008	155	525.75	3391.94
2009	258	780.40	3024.81
2010	295	1016.05	3444.25
2011	216	810.87	3754.06
2012	130	766.56	5896.66

The quarterly dynamics of changes in the number of concluded contracts and their value is characterized with a strongly pronounced seasonal nature, the number of concluded contracts and their value increased significantly in the 4th quarter of each year (see Figure 2). That is, nearly half of all contracts concluded during 2010 were concluded in the last three months of the year.

Figure 2

The quarterly and yearly breakdown of concluded contracts by the number of contracts and value, % of the total number and value



As for the distribution of contracts according to the types of procurements, 23% of contracts concluded were for goods (21% of the procurement value), 15% for works (31% of the procurement value), and 62% for services (49% of the procurement value) (see Table 2).

Table 2

Contract breakdown by the type of procurements: goods / works / services

Parameters	Quantity		Total value	
	contracts	%	RUR million	%
Goods	247	23	799.50	21
Works	158	15	1206.07	31
Services	649	62	1894.07	49

The largest share of procurements (both in terms of quantity and in terms of value) falls within the category of experience goods (71% in terms of quantity, and 76% in terms of value), and the smallest was credence goods (7% in terms of quantity, and 5% in terms of value) (see Table 3).

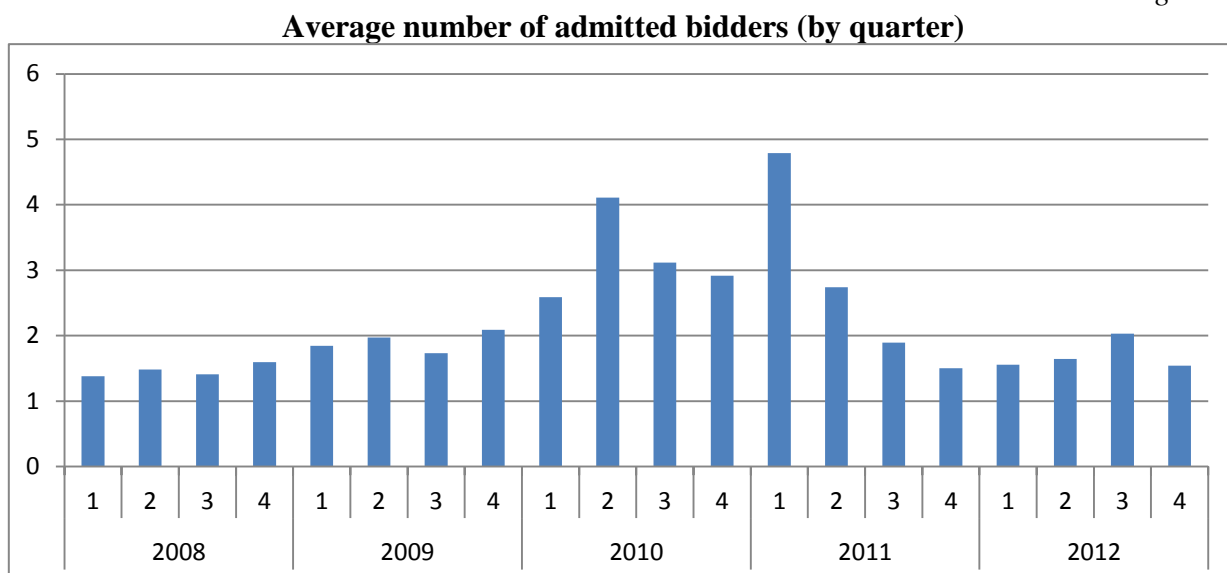
Table 3

Contract breakdown by the type of procured goods: search / experience / credence goods

Parameters	Quantity		Total value	
	contracts	%	RUR million	%
Search goods	241	23	738.35	19
Experience goods	744	71	2981.93	76
Credence goods	69	7	179.36	5

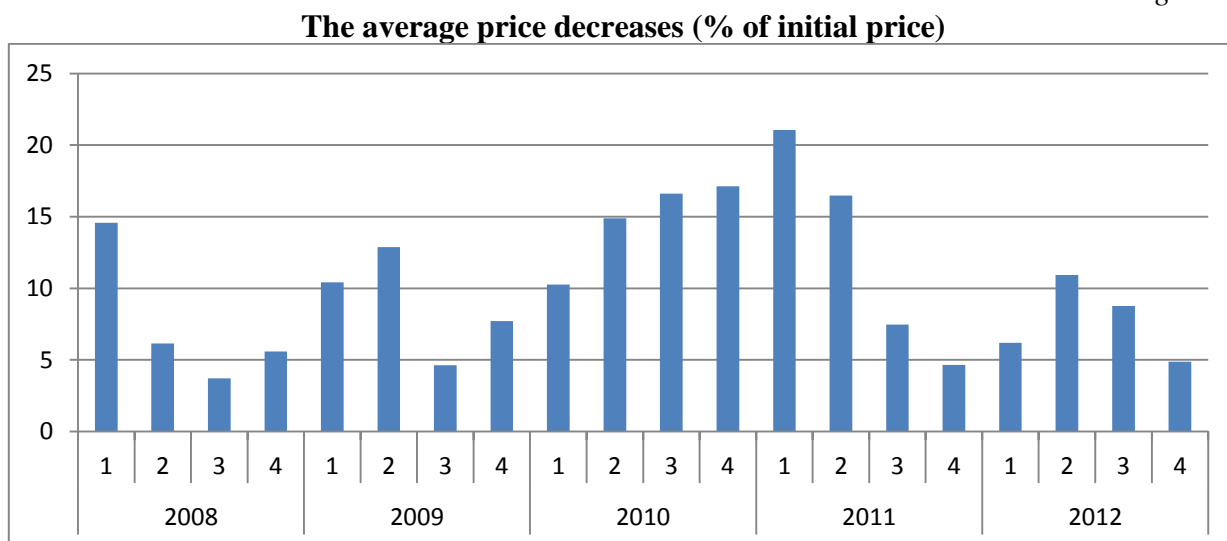
The competition was 3–4 admitted bidders on average from the second quarter 2010 until the second quarter 2011, whereas in other period it is significantly less (Figure 3).

Figure 3

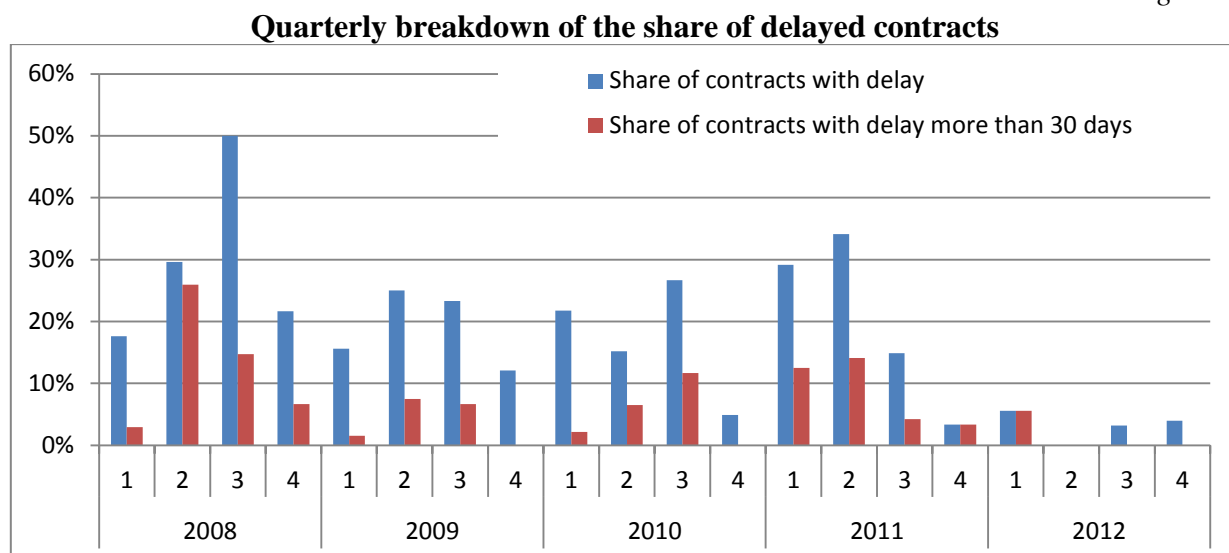


The average price decrease from the second quarter 2010 until the second quarter 2011 is 15-20% of initial price, whereas this factor is 4-14% in other periods (Figure 4).

Figure 4



The delays in the execution of obligations by the quarter of contract conclusion shows that the main share of delayed contracts were registered in 2008, with the largest number of contracts delayed by more than 30 days in the second quarter of the year and with 50% of the total contracts being delayed in the third quarter of 2008. There is opposite dynamic in 2012, the share of delayed contracts in each quarter did not exceed 5%; moreover, a delay exceeding 30 days was registered only at the beginning of the year (see Figure 5).



Further we consider procurements in the following three periods.

- **period 1** – before enactment of the legislation on electronic auctions: from 1st quarter 2008 until 2nd quarter 2010 (for some goods until 4th quarter 2009)
- **period 2** – this legislation was in force for the organization: for some goods from 1st quarter 2010 and for all goods of auction list from 3rd quarter 2010 until 2nd quarter 2011.
- **period 3** – the period after Procurement provision adoption: from 3rd quarter 2011 until 4th quarter 2012.

The number of contracts concluded through open auctions in 2012 was nearly half of 2008, their total value also decreased by approximately 20%. The average contract value grew considerably by the end of the period (see Table 4). The highest number of admitted bidders (3.03) was in period 2. During the same period, the largest share of contracts were concluded with price decreases (65%), the average price decrease was 25.67%, whereas in period 3 prices decreased by 11.69% on average. As far as delayed contracts are concerned, this figure dropped from 27% in the period 1 to 5% in the period 3, with the most intensive reduction being registered in the period 3. The longest average delay was 38.11 days, registered in the period 2.

Table 4

Comparative characteristics of procurements in different periods			
Parameters	period 1	period 2	period 3
Number of contracts	521	317	216
Procurement value (RUR million)	1520.18	1185.51	1193.94
Average contract value (RUR thousand)	2917.82	3739.80	5527.53
Number of admitted bidders	2.10	3.03	1.60
Share of contracts with price decreases (%)	44	65	52
Average price decrease (%)	21.35	25.67	11.69
Share of delayed contracts (%)	27	21	5
Average delays (days)	30.64	38.11	22.89

5. Econometric Research Methodology

We test the formulated hypotheses on the basis of previously proposed and piloted methodological approaches to the analysis of overall procurement effectiveness (A. Yakovlev, Demidova, and Balaeva 2013; A. A. Yakovlev et al. 2013). Our regression models use the following dependent variables:

- the number of admitted bidders to the auction;
- the relative price decrease during the auction ($[(\text{starting price} - \text{winner's price}) \div \text{starting price}] * 100\%$);
- the number of wins at different auctions organized by the organization during each period calculated for each contracting supplier;
- the length of delays in execution of contractual obligations, days ($\max[0, \text{date of actual delivery} - \text{contractual delivery date}]$).

Using relevant control variables, we included in our models the type of the procured goods based on the “works/goods/services” and “search/experience/credence” classifications. The other factors are the procurement budget (or the contract value for the hypotheses in group 3), contract duration, the quarter of delivery, and the attribution of the supplier’s region to the customer’s region. The main focus is on two dummy variables included in the models – periods before the introduction of electronic trading platforms and the period after transfer to the organization’s own Procurement Provision, so the period of electronic auctions under 94-FL is the reference category. The full list and descriptions of variables used in regression analysis is presented in Table P1 of the Annex.

The dependent variable in models characterizing the level of competition is counting. Therefore to analyse this factor we use both linear models and the negative binominal distribution model.¹ The dependent variable in modelling the relative price decrease and the delays in delivery is continuous. Therefore to analyse these factors we use linear models evaluated by the least-squares method.

As the budget of the bid (contract value) is included as an independent factor in all models and its value is by several orders of magnitude greater than the value of dependent variables, the hypothesis concerning the inclusion of this factor in the logarithmic form was accepted on the basis of the Box-Cox test. The variable representing the number of accepted bidders is added to other models.²

¹ The Poisson distribution model assessment was also performed, but the hypothesis on equality of the theoretical mean value and variance was dismissed.

² As this variable can correlate with errors in the price decrease, number of repeated contracts, and delivery delay models, we evaluate a system of equations where the first equation assess the number of accepted bidders estimated through the number of submitted bidders (for arguments see, e.g. (De Silva et al. 2008; De Silva et al. 2013)), and the second – the corresponding basic variable. In so doing, we assume that the errors in these equations are independent, therefore their coefficients are evaluated by the two-step least squares method.

Our models have the following formula:

$$y_t = c + \beta_1 T_1 + \beta_2 (T_2 \times O) + \beta_3 (T_2 \times E) + \gamma X_t + \varepsilon_t,$$

where t is the sequential number of the auction held by the organization. The main focus in this specification is on estimation of β coefficients. The variable T_1 equals 1 if the procurement was made before July 2010 through “hammer” auctions and 0 otherwise. The variable T_2 equals 1 if the auction was held after the adoption of the organization’s own Procurement Provision, i.e. after July 2011. The variable O equals 1 if the procurement was made through open “hammer” auctions, and E equals 1 if the procurement was made through electronic auctions. The β_1 coefficient shows the average change in the dependent variable during the use of “hammer” auctions held in the first period compared to electronic auctions held in the second period. The β_2 and β_3 coefficients show the average change in the dependent variable during the use of “hammer” and electronic auctions held after the adoption of the organization’s own Procurement Provision, compared to electronic auctions held in the second period.

According to the hypotheses described above, we expect all β_1 , β_2 and β_3 coefficients to be negative. Our models contain a set of control variables X_{it} for the contract life, procurement type, the supplier’s region, etc.

6. Results of Regression Analysis

The results of estimation of the models characterizing the level of competition at the auction are presented in Table 5. According to the data, transfer to electronic open auction platforms resulted in a significant increase in competition—the number of admitted bids increased by 0.82 on average (see coefficient β_1 in linear models). The adoption of the Procurement Provision by the organization under survey led to considerable changes, but had a reverse effect—the number of bids admitted to the auctions dropped by 1.7 on average for both types of auctions. At the same time, the data confirm the earlier formulated hypotheses in group 1.

Table 5

Estimation results for level of competition models

		Model 1	Model 2	Model 3	Model 4
		Linear	Linear	Negative binominal	Negative binominal
Procurement description	Set of variables included in the model	Dependent variable		Dependent variable	
		Number of admitted bids	Number of admitted bids	Number of admitted bids	Number of admitted bids
Period before electronic auctions (β_1)		-0.82***	-0.86***	-0.33***	-0.35***
Open auctions under own Procurement Provision (β_2)		-1.50***	-1.65***	-0.66***	-0.72***
Electronic auctions under own Procurement Provision (β_3)		-1.82***	-1.77***	-0.77***	-0.76***

Quarter of delivery	1	Reference category			
	2	2.01***	2.07***	0.72***	0.76***
	3	0.069	0.087	0.05	0.068
	4	0.12	0.17	0.073	0.1
Contract life (days)		0.00086*	-0.00004	0.00034*	-0.000065
Contract budget logarithm (RUR)		0.28***	0.35***	0.13***	0.16***
Procurement type according to Nelson-Darby- Karni classification	Search goods	Reference category			
	Experience goods		-0.60***		-0.27***
	Credence goods		-0.92***		-0.39***
Procurement type according to standard classification	Goods	Reference category			
	Works	0.092		-0.029	
	Services	-0.94***		-0.42***	
R^2 (adjusted or pseudo)		0.139	0.122	0.063	0.057
P-value for the hypothesis $\beta_2 = \beta_3$		0.13	0.50	0.26	0.69
Number of samples		1024	1024	1024	1024

*, **, *** – the coefficient is significant at 10%, 5%, 1% levels.

An analysis of relative price (Table 6) shows that in the second period (obligatory use of electronic trading platforms for holding auctions) price decreases were more significant, in the first period prices were on average 3.6% lower than in the second period (the β_1 coefficient), and in the third period prices for “hammer” auctions were on average 4% lower, and for electronic auctions 7.5% lower than in the second period (coefficients β_2 and β_3). The use of “hammer” auctions within the jurisdiction of the organization’s own Procurement Provision was characterized by the same reduction of the price decrease in absolute figures as the increase of this parameter during the second period (the hypothesis $\beta_1 = \beta_2$ is not rejected). The presented findings substantiate the earlier formulated hypotheses from group 2.

Table 6

Estimation results for auction price decreases

		Model 5	Model 6	Model 7	Model 8
		Linear	Linear	Linear(S)	Linear(S)
Procurement description	Set of variables included in the model	Dependent variable		Dependent variable	
		Price decrease (%)	Price decrease (%)	Price decrease (%)	Price decrease (%)
Period before electronic auctions (β_1)		-3.65***	-3.71***	-3.62***	-3.69***
“Hammer” auctions under own Procurement Provision (β_2)		-3.98***	-3.81***	-3.93***	-3.77***
Electronic auctions under own Procurement Provision (β_3)		-7.27***	-7.96***	-7.20***	-7.91***
Number of admitted bids		4.04***	4.01***	4.07***	4.04***
Quarter of delivery	1	Reference category			
	2	5.25**	5.29**	5.18**	5.24**
	3	1.04	1.09	1.04	1.08
	4	1.65	1.66	1.65	1.65
Contract life (days)		-0.0026	-0.0011	-0.0027	-0.0011
Contract budget logarithm (RUR)		-0.25	-0.35	-0.26	-0.36

Supplier from the customer's region		-0.84	-0.9	-0.83	-0.89
Procurement type according to Nelson-Darby- Karni classification	Search goods	Reference category			
	Experience goods		3.74***		3.76***
	Credence goods		4.74**		4.76**
Procurement type according to standard classification	Goods	Reference category			
	Works	2.96*		2.96*	
	Services	4.32***		4.35***	
R^2 (adjusted)		0.349	0.348	0.348	0.348
P-value for the hypothesis $\beta_2 = \beta_3$		0.78	0.95	0.79	0.96
Number of samples		1024	1024	1024	1024

*, **, *** – the coefficient is significant at 10%, 5%, 1% levels.

An analysis of delays in execution of contractual obligations (Table 7) shows that the transfer to electronic auctioning had no significant impact on delays (coefficient β_1), whereas the transfer to the organization's own Procurement Provision resulted in a substantial decrease in delays by 3 days on average (coefficient β_2). The presented findings partially confirm the earlier formulated hypotheses from group 3.

Table 7

Estimation results for contract delay models

		Model 9	Model 10	Model 11	Model 12
		Linear	Linear	Linear(S)	Linear(S)
Procurement description	Set of variables included in the model	Dependent variable		Dependent variable	
		Delay	Delay	Delay	Delay
Period before electronic auctions (β_1)		2.91	3.9	2.99	4
"Hammer" auctions under own Procurement Provision (β_2)		-2.88*	-4.42***	-2.75*	-4.18***
Electronic auctions under own Procurement Provision (β_3)		-0.46	-4.34**	-0.34	-4.17**
Number of admitted bids		1.83*	1.95*	1.99*	2.19**
Quarter of delivery	1	Reference category			
	2	6.02	4.63	5.9	4.43
	3	2.41	0.93	2.41	0.93
	4	-2.91	-3.52	-2.91	-3.53
Contract life (days)		-0.014	-0.028***	-0.014	-0.028***
Contract budget logarithm (RUR)		-1.1	-0.59	-1.14	-0.65
Supplier from the customer's region		0.52	1.6	0.55	1.63
Price decrease as%		-0.13	-0.11	-0.14	-0.13
Procurement type according to Nelson-Darby- Karni classification	Search goods	Reference category			
	Experience goods		7.94***		8.11***
	Credence goods		-2.9		-2.66
Procurement type according to standard classification	Goods	Reference category			
	Works	12.4***		12.4***	
	Services	4.66**		4.83**	
R^2 (adjusted)		0.045	0.046	0.045	0.046
Number of samples		828	828	828	828

*, **, *** – the coefficient is significant at 10%, 5%, 1% levels.

7. Conclusion

In this paper, relying on an empirical dataset for a large state university from 2008-2012, we estimated the impact of different changes in regulation on the effectiveness of public procurement. In particular, we wanted to determine the impact on public procurement effectiveness parameters following two reforms: the enactment of the obligatory use of electronic trading platforms for open auctions and the extension of opportunities for public customers to introduce their own Procurement Provisions. Such parameters included the level of competition at auctions, price decreases during the auction, and delays in execution of concluded contracts. From the analysis of organizational legal procedures prescribed by 94-FL for open electronic auctions, we assumed that the introduction of electronic auctions would lead to an increase in the level of competition, more significant decreases in the initial auction price. On the other hand, we assumed that the use of electronic trading platforms envisaged by 94-FL would result in longer delays in the execution of contractual obligations. At the same time, considering the requirements of the Procurement Provision of the organization, we assumed that its adoption would produce opposite effects.

The results of analysis have partially confirmed our hypotheses. Specifically, the use of electronic trading platforms for open auctions has in fact produced significant effects: the level of competition during the electronic auctions was higher and the relative decrease of the initial price was greater. The adoption of the organization's own Procurement Provision had just the opposite effect: the level of competition has dropped substantially compared to electronic auctions, the decrease of the starting price was less significant, and the number of repeated contracts grew. As for contract delays, the transfer to electronic trading platforms did not lead to significant changes in this parameter, whereas the adoption of the organization's own Procurement Provision resulted in considerable reduction in contract delays.

Our findings need additional verification based on a wider sample of data and they have some application restrictions. The most significant one is the size of organization under consideration and sphere of activity. Only those organizations, who have large assets would get additional income from transferring to autonomous status. Moreover, in order to create an organisation's own Procurement Provision it is necessary to have well qualified staff, but this provision provides more flexibility in regulation which has a positive effect on the price-quality ratio for organization's procurement effectiveness.

Regarding the broader policy implications, in our opinion, this approach, involving the gradual implementation of new practices, is conducive to a better understanding of new regulatory practices. In this context, the comparison between different forms of regulation and quantitative

measurements of the impact of regulatory changes on procurement performance of public entities will help reduce the costs of reform and identify and disseminate best practices.

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Annex

Table P1. Description of variables

Variable	Values	number	%
Type of procured good according to the Nelson - Darby - Karni classification ^{a)}	Search goods	241	22.87
	Experience goods	744	70.59
	Credence goods	69	6.55
	Total	1054	100
Type of procurement according to the standard Russian classification ^{a)}	Goods	247	23.43
	Works	158	14.99
	Services	649	61.57
	Total	1054	100
Quarter of delivery	1	56	5.31
	2	95	9.01
	3	155	14.71
	4	748	70.97
	Total	1054	100
Number of bids submitted	Min = 1, Max = 36, Average = 2.79, Median = 2, Standard deviation= 3.23.		
Number of bids admitted	Min = 1, Max = 30, Average = 2.28, Median = 1, Standard deviation= 2.50.		
Contract life (days)	Min = 4, Max = 1119, Average = 161.88, Median = 94, Standard deviation= 158.87		
Logarithm of the bid budget (RUR)	Min = 10.3, Max = 19.01, Average = 14.36, Median = 14.4, Standard deviation= 1.24		
Logarithm of the contract value (RUR)	Min = 10.12, Max = 18.86, Average = 14.22, Median = 14.27, Standard deviation= 1.27		
Delays in contract fulfilment (days)	Min = 0, Max = 369, Average = 6.82, Median = 0, Standard deviation= 29.66		
Auction price decrease (%)	Min = 0, Max = 85, Average = 10.91, Median = 0.17, Standard deviation= 18.17		
Number of contracts with each contracted participant	Min = 1, Max = 52, Average = 7.11, Median = 3, Standard deviation= 11.32		
Repeated contract with the same supplier	1 – Yes	755	71.63
	0 – No	299	28.37
	Total	1054	100
Period before electronic auctions	1 – Yes	533	50.57
	0 – No	521	49.43
	Total	1054	100
Period after the adoption of the Procurement Provision	1 – Yes	838	79.51
	0 – No	216	20.49
	Total	1054	100
Supplier from the customer's region	1 – Yes	82	7.78
	0 – No	972	92.22
	Total	1054	100

a) The variable is categorical. In the estimated models, these variables were replaced by a set of dummy-variables, e.g. the “method of procurement” variable was replaced with the variables “auctions” (1 – if there has been an auction during the order placement and 0 – otherwise), “tenders” (1 – if there has been a tender during the order placement and 0 – otherwise), etc., and quotations were used as the designated category.

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