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THE EFFECTIVENESS OF SIMPLE HOMOGENEOUS COMMODITY PROCUREMENT UNDER RIGID GOVERMENTAL REGULATION: THE CASE OF GRANULATED SUGAR PROCUREMENT IN RUSSIA[4]

In the 2000s the Russian government considered electronic auctions (e-auctions) as the best way to procure goods for public needs. In this paper we confirm this proposition using an empirical dataset of contracts for the procurement of granulated sugar in Russia in 2011. Our data shows that unit prices are higher in the case of long-term contracts. This result can be explained by the rigidity of public procurement regulations as Russian legislation allows only fixed price contracts. Under these conditions suppliers can participate in public procurement tenders for long-term contracts only if their price includes a "risk premium" covering additional expenses of the supplier in case of an unfavorable turn in the market. Our analysis shows that sugar prices in Russian public procurement are lower for contracts with higher volume. These results are in the line with conclusions of previous studies of public procurement in other countries. The influence of competition measured by the number of suppliers participating in the procurement procedure has a quadratic form. It means that the effect of a new participant is lower when number of competitors is higher and vice versa. Our analysis also shows that there are essential distinctions in the influence of the same factors on contract prices for competitive procedures and void auctions.

JEL Classification: H57, P35.

Key words: public procurement, e-auctions, procurement effectiveness.

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Introduction

Public procurement accounts for a considerable part of the budget of most countries. The choice of optimal public procurement methods is a matter of particular importance, as more effective procurement saves a significant amount of public funds.

Both researchers and politicians share the prevailing opinion that electronic auctions (e-auctions) could become such a procedure. In particular, Ageshin (2001) states that due to greater transparency and the low cost of obtaining information, this procurement method brings about near perfect competition and, consequently, ensures the procurement of better goods and services at lower prices.

However, from the point of view of institutional economy and the theory of contracts, the choice of suppliers through e-auctions for complex or package procurements[1] may generate the effect of "negative selection," as in the absence of filters based on business reputation and insufficiently competent qualification assessment or unscrupulous executors offering knock-down prices for the sake of gaining a contract would end up as the auction winners. Nevertheless, in cases of simple and homogeneous products, the qualitative characteristics of which can be easily set out in the tender documentation and verified at the point of delivery,[2] e-auctions can be considered the most effective procurement method. This is precisely the case described in this paper.

The purpose of this survey is to analyze the factors influencing the price effectiveness of the procurement of a simple homogeneous product, using the example of granulated sugar procurement in Russia. In this work, price effectiveness is measured using three indicators. In our opinion, a more effective auction results in lower prices, greater price reductions and a larger difference between regional retail and contract price (if the contract price is lower than the regional price).

In addition, we establish that e-auctions ensure better price effectiveness in comparison with other procurement methods. The availability of statistics on regional retail prices will also allow us to compare the prices of the contracts for the supply of granulated sugar with retail prices in considered regions.

The article is structured in the following way: section 1 offers an overview of previous research on the subject, section 2 formulates the hypotheses to be tested, section 3 describes the market of public procurement of granulated sugar and the available data, section 4 presents the

[1] According to the Nelson-Darby-Karni classification, they may be referred to the category of "experience" and "credence" goods, see Nelson (1970), Darby&Karni (1973), and Tirole (1988).
[2] The Nelson-Darby-Karni classification refers such products to the category of "search" goods.

testing methods of the hypotheses and their results, and section 5 contains the main conclusions and economic policy recommendations.

1. Literature Survey

There are two aspects in examining the placement of contracts. The first involves effectiveness analysis of various procurement procedures in terms of procurement and transaction costs for the buyer. The second analyses the errors that may occur during the placement of a contract both due to corruption and collusion and as the result of external factors such as political pressure.

There is no unequivocal answer to the question which is more effective: public procurement via e-auctions or negotiations with individual suppliers. Vellez (2011) shows that auctions in the medical technology market in Italy do not necessarily result in a greater price reduction than negotiations. However, Lalive and Schmutzler (2011) demonstrate that the prices under contracts concluded through auctions in the German railway construction market were lower. Such a difference may be connected with the specific characteristics of the markets under survey. In this context, it would be interesting to check whether auctions would lead to a reduction in procurement prices of granulated sugar in Russia.

MacDonald, Handy and Plato (2002) compare the prices in the private sector with the prices in auctions held by the United States Department of Agriculture (USDA) and conclude that the typical wholesale price of comparable goods exceeds the price of contract. In addition, they discovered a nonlinear relation between the number of auction participants and the contract price: the marginal effect of an additional supplier joining the bid is low if the number of participants is large and high if the number of participants is small, but in both cases this effect is significant.

In a separate group of studies on e-auctions, this method is considered o be more transparent, open and, consequently, ensures greater competition, which ultimately leads to a price reduction. Soudry (2004) has demonstrated that British e-auctions ensure better results than the first price auctions for products easily describable in quantitative terms. He also notes, however, that this type of auction is more sensitive to collusion, especially with recurrent interactions between the buyer and the suppliers. Singer, Roubik and Beffermann (2009) make a quantitative evaluation of the consequences of the transition to an e-procurement system in Chile. This transition resulted in a 0,28%–0,38% cut in administrative outlays and a 2,65% reduction in procurement prices. Pavel and Sičáková-Beblavá (2013) show that e-auctions lead to an increase

in competition among the bidders and, as a consequence, to lower prices. The authors explain this effect by the relatively easy participation in such auctions and their greater transparency.

However, Vaidya, Sajeev and Callender (2006) point out that the transition to e-procurement does not always have favourable consequences, but involves considerable financial and time expenditure. The transition to more transparent procurement methods can be explained by political considerations. For example, Moszoro and Spiller (2012) show that if there is a potential risk of accusations of corruption, public officials may prefer using strictly formalised and economically less effective procurement procedures. Chong, Staropoli and Yvrande-Billon (2009) demonstrate that the choice of auctions as the predominant method of contracting as compared to negotiations is connected, inter alia, with political motives.

An important factor that should be taken into account when evaluating the effectiveness of auctions, including electronic ones, is the possibility of corruption and collusion. Li and Zheng (2009) note that their conclusion regarding less aggressive competition at an auction following an increase in the number of bidders could change if the possibility of collusion is included in the model. A number of surveys (Chever & Moore (2012), Porter & Zona (1993, 1997)) show the presence of collusion in contract markets. Podkolzina and Morozov (2012) demonstrate the presence of collusion between suppliers in the road construction markets in one Russian region as a result of which competition was actually brought to naught despite nominal participation of several bidders in the procurement procedure.

The active reform process of the public procurement sector in Russia has sparked the interest of the academic community . Yakovlev, Demidova and Balaeva (2012) use the case of a major state-funded organisation to demonstrate that problems with the fulfilment of contractual obligations occur more frequently under contracts concluded through auctions, especially large contracts. Balsevich, Pivovarova and Podkolzina (2012) demonstrate, using information on procurement in ten Russian regions, that the prices of gasoline under contracts are lower if there is a greater level of information transparency, even without a considerable increase in competition.

This paper in some of its methodological aspects builds on the previous Russian studies. At the same time, its novelty lies in the analysis of the price effectiveness of e-auctions on the basis of national Russian data on the procurement of a simple, homogeneous and staple commodity.

2. Hypotheses

This work analyses the influence of the procurement method on its effectiveness. It also tests a number of auxiliary hypotheses:

Hypothesis 1. Using valid e-auctions results in a greater price reductions compared to other procurement methods.

Hypothesis 2. An increase in the number of auction participants leads to more effective procurement. The effect may be nonlinear.

Hypothesis 3. For larger contracts the prices per kg (of sugar) are lower.

Hypothesis 4. For longer terms contracts the prices per kg (of sugar) are higher.

As far as the first hypothesis is concerned, in single-source procurements and procurements based on the results of void auctions no considerable price reduction is to be expected. Requests for quotations, theoretically, should lead to smaller price reductions than valid auctions, as quotations are intended for the procurement of smaller volumes of goods due to the specifics of the Russian legislation. E-auctions also open access to participation in procurements for more suppliers.

The second hypothesis follows previous studies (Pavel & Sičáková-Beblavá (2013), Gomez-Lobo & Szymanski (2001)). The assumption that with a relatively larger number of bidders the marginal effect of appearance of a new competitor would be lower than in a situation with a small number of competitors also is logical. As mentioned above, this effect was seen in the US food procurement market (MacDonald, Handy & Plato (2002)).

An increase in the contract volume, hypothesis 3, should lead to a reduction of the unit price of the procured goods. This is what happens in normal markets. It is sufficient to compare the retail and wholesale prices of any product, including sugar, to see that this is so. Chever, Saussier and Yvrande-Billon (2012) demonstrate that this pattern should persist, inter alia, in the market of contracts.

According to the Russian law, the price of a contract cannot be changed in the process of its execution (except contracts on fulfillment of certain jobs), therefore, in the event of an increase of free market prices the supplier is liable for losses. To compensate for such risks, suppliers will agree to conclude long-term contracts only if the prices are higher (Chever, Saussier & Yvrande-Billon (2012)), which leads us to the formulation of the fourth hypothesis.

The four hypotheses concern the impact of various factors on price effectiveness in public procurement. We also take into account the fact that the same factors can have a different influence on prices for contracts placed through different procurement procedures. We test this

hypothesis using a test similar to the Chow test, which compares coefficients for the same factors in the models estimated separately for different groups of contracts

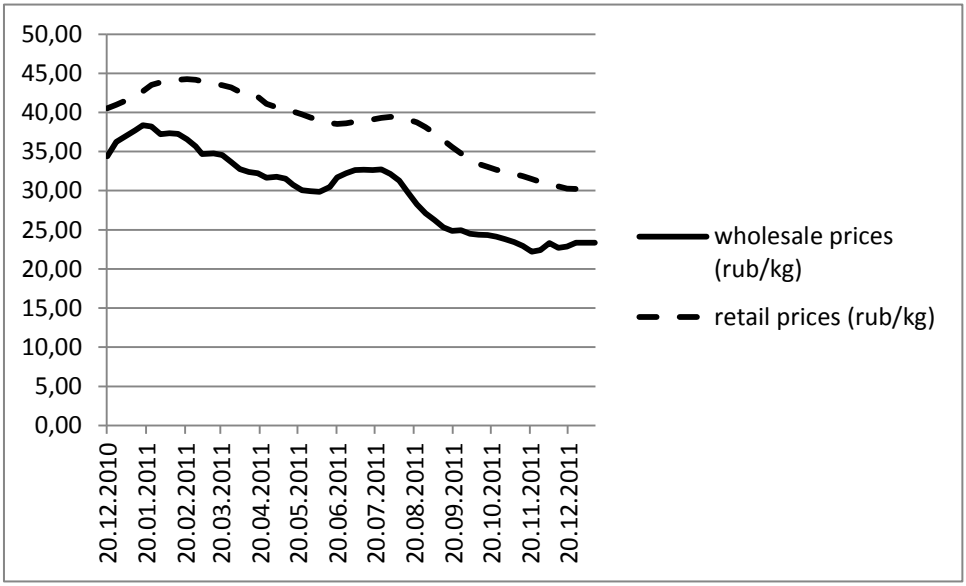
3. Data Description

3.1 General Characteristics of the Sugar Market in the Russian Federation[1]

Granulated sugar production and consumption have a strong seasonal pattern. Production of sugar beet is generally from September to November, and the production of raw sugar from March to July. Consumption usually peaks in July. Domestic prices depend on supplies of cheaper imported sugar.

During the past several years, the retail price of granulated sugar in the Russian market varied from 21,3 rub/kg in April–May 2007 to 44,3 rub/kg in February–March 2011. During 2011, the price dropped by nearly 30% (see Fig. 1) owing to a record-breaking harvest of sugar beet. The average retail mark-up on wholesale prices in Russian is 25–30%. A batch of sugar exceeding 20 tonnes is generally considered a wholesale shipment.

Figure 1.Dynamics of Average Wholesale and Retail Prices of Sugar during the Period from December 2010 to December 2011



Source: Rosstat, Average weekly retail prices of some goods and services; Sugar Monitoring ISCO-I

Retail prices of granulated sugar vary quite significantly across the regions of Russia. The lowest levels are registered in the federal districts where the largest sugar manufacturing

[1] The authors express their acknowledgements to Nina Yershova whose materials were used for writing this section.

companies are situated. In the Far Eastern District, which is the farthest from the places of sugar production, sugar prices in 2011 were 60% higher.

The sugar market is highly concentrated. The share of the three largest manufacturing companies is nearly 50%. Most of the national demand for sugar in Russia comes from retail consumers (approximately 50%), the food industry (about 40%), as well as hotels and public catering enterprises (7%). Public procurement accounts for 0,5% of the overall sugar sales in the Russian market.

3.2 Sampling Specifics

This work uses data on simple contracts for the procurement of sugar concluded in the period from 1 January 2011 to 31 December 2011 provided by the Unified Register of Federal and Municipal Contracts. This data contains all contracts concluded in the Russian Federation during that period where granulated sugar is the only supply item, and represents a continuous sample.

Data on 2 975 contracts were taken from the Register, but not all entries contained complete information on the stages of the contract placement and fulfillment. In particular, in some cases the information on the amount ordered, the starting price, the number of auction participants was missing.

After excluding files with data gaps we were left with 2 720 contracts (over 90% of the initial sample) for an overall volume of 11 300 tonnes at approximately 450 million rubles.

Following the analysis of price reductions achieved in the process of auctions, single-source contracts and contracts concluded through void auctions were also removed from the sample. The final sample for assessment was 2 323 contracts for 5 100 tonnes at 173 million rubles.

3.3 Public Procurement Effectiveness Characteristics

We will consider the following public procurement effectiveness characteristics: price per kilo, the price reduction during the auction compared to the starting (maximum) price, and deviation of the contract price from the average retail price in the region, to which the buyer belongs. The main descriptive characteristics are presented in Appendix 1. To exclude the impact of general market fluctuations, all prices were standardized on the basis of the average price of granulated sugar in Russia at the moment of summing up of the procurement procedure results. The average proportion of the price of sugar under contracts to the average retail price across Russia was approximately 0,9.

To analyze the effectiveness of the procurement process, we reviewed the differences between four types of contracts: single-source contracts, requests for quotations, e-auctions, and void e-auctions (when there was only one participant). As a rule, there is no price reduction for

single-source procurement or contracts based on a void e-auctions. For requests for quotations, the price decreased by 13% on average, and for valid e-auctions by 9%.

At first glance, the group of single-source contracts and contracts placed through void e-auction are similar, because in both cases the order is placed without bidding. However in single-source contracts the buyer decides to restrict competition while initially void e-auctions supposed to be competitive procedures. It may be a legitimate question about the appropriateness of allocating a separate group to requests for quotations with one only participant. However, preliminary analysis shows that there is no significant difference between requests for quotations with one, and more than one participant.

The comparison of the price of one kilogram of sugar under a contract with the weekly average retail price of sugar in the region of the buyer's location at the moment of the contract placement shows that in 83% of all cases the contract price of one kilogram of sugar is lower than the average in the relevant region of Russia.

3.4 Other Characteristics of Contracts

A considerable part of the sample (97%) consists of relatively small contracts (less than 20 000 kg). Nevertheless, they account for only 37% of the total procurement volume. At the same time, we can see from Table P1 in the appendix that the bulk of the sample consists of small contracts (up to 100 000 rubles)[1]. On average, the decrease of the contract price per kilogram decline together with the size of the contract, the average contract price per kilogram grows as well.

Contracts placed by different methods differ both in price and in volume (see Table P2). Prices are lower and the price decrease and its deviation from the regional average is greater for contracts placed through requests for quotations. Sugar prices under single-source contracts have the least deviation from the regional average. In addition, although such contracts are relatively few in quantitative terms, they account for a considerable share of the total procurement volumes both in kind and in cost.

The average contractual period is approximately 125 days (see Table P3). Contracts with supply terms exceeding 200 days are on average more expensive than shorter-term contracts but the volumes of supply under the former are larger. At the same time, the size of the price decrease diminishes as the contract period becomes longer and the contract price per kilogram grows.

Single-source contracts significantly differ from contracts awarded by other methods in terms of volume, price, and length (see Table 1). This suggests the heterogeneity of the market

[1] According to Federal Law 94-FL, procurements to the sum less than 100 000 rubles in 2011 could be made without an auction (against an invoice of a single supplier).

and that the choice of procurement method could be based not only on the effectiveness comparison for procedures, but on other considerations. Unfortunately, the available data do not allow us to provide an analysis of this group of contracts to identify buyer incentives. Taking this into account we exclude from the further analysis single-source contracts.

Table 1. Characteristics of contracts.

Type of procurement	Contract price (rubles)	Contract volume (kg)	Starting (maximum) sugar price (rubles/kg)	Contract sugar price (rubles/kg)	Term of delivery (days)
Single-source	3 126 378	69 721	44,28	43,36	238
Void e-auction	65 904,31	1 734	37,87	37,84	151
E-auction	92 141,26	2 615	36,52	32,77	142
Request for quotation	63 851,12	1 931	39,04	33,61	104

In addition, we exclude from the analysis contracts with a price higher than 500 000 rubles, because procedures may be used only for contracts with lower price according to the law. Furthermore, as can be seen from the descriptive statistics (see Appendix 1) contracts are not homogeneous in terms of volume and price. There are contracts of small volumes (18-20kg) and a very large (up to 350t). The exclusion of the largest contracts helps to mitigate this heterogeneity.

4. Modeling the Effectiveness of Contract Placement

4.1 Choice of Models

This work analyses contract placement effectiveness indicators which are continuous variables, and using the least-squares method we evaluate the impact of various factors on the characteristics of the contracts. Because of the possible heteroscedasticity we use robust estimates for the covariance matrix of coefficients.

The following variables will be regarded as dependent variables:

- the contract price standardized on the basis of the average price in Russia at the moment of the contract placement;
- the decrease of the price of one kilogram of sugar in the process of the contract placement (as portion of the standardized starting (maximum) contract price;

- the deviation of the contract price from the average retail price in the region at the moment of the contract placement (as portion of the standardized regional retail price).

All models wherever possible use the following regressors: the contract volume (in kilograms or as a dummy variable for the contract value), scheduled contract execution period (in days), the number of participants in the procurement procedure, the average regional price of one kilogram of sugar at the moment of the contract placement standardized on the basis of the average price of sugar in Russia at the same moment. We include control variables in all models in the form of sets of dummy variables coupled with the contract placement month.

We check whether the influence of the same factors on the price performance of the contract is the same for different procurement methods. We add dummy variables to the models for procurement methods (e-auction is the base category) and their cross-products with all other covariates. Then we check them for joint significance. In fact, this test is an analogue of the Chow test. In the case of significant differences in the impact of factors for different types of procedures we estimate models separately for every procurement method. We also include the number of participants as covariates.

4.2 Hypotheses Testing Results

After removing from consideration contracts worth more than 500 000 rubles and single-source contracts, there are 2 609 observations in the data set, of which 1 460 contracts were placed by a request for quotations, 839 by the e-auction and 310 by void e-auction. Firstly, we verify whether all the data can be included in one model. To do this, we use the previously described procedure: including dummy variables and their cross-products with other covariates in the model to test the hypothesis that there are significant differences in the coefficients of all regressors for e-auctions and other procurement methods. Test results are shown in Table 2. Hypotheses about the same influence of the factors included in the models are rejected at any reasonable level of significance. Consequently, it is necessary to evaluate independent models for each of the procurement methods. We also include the number of participants in the models for e-auctions and requests for quotation, and we assume a quadratic dependence on this regressor, which is consistent with the assumption of a decreasing effect on the growth of the level of competition, confirmed previous studies (Pavel & Sičáková-Beblavá (2013), Gomez - Lobo & Szymanski (2001)).

Table 2 also shows the coefficients for the dummy variables for the differentiation of procurement method (the void e-auctions or requests for quotations) from e-auctions. To avoid the problem of multicollinearity and to improve the effectiveness of estimates we test hypotheses about the joint significance of coefficient groups and exclude them from the model in case of insignificance. According to Table 2 there is a significant difference in the price characteristics

for contracts placed using different procurement methods, compared with e-auctions the sugar price is higher for requests for quotations and void e-auctions.

Table 2. The results of the Chow test analogue. [a)]

Model		Contract price of one kilogram of sugar		Price reduction	Price deviation from regional price	
		E-auction and void e-auction	E-auction and request for quotation	E-auction and request for quotation	E-auction and void e-auction	E-auction and request for quotation
with contract volume	Test	11,72***	6,60***	20,75***	12,77***	6,06***
	Dummy coefficient[b)]	-0,453***	0,062***	0,280***	0,269**	-0,067***
with contract price dummy	Test	12,77***	7,39***	28,38***	14,10***	6,76***
	Dummy coefficient[b)]	-0,469***	0,051**	0,287***	0,283**	-0,057***

[a)] *** null hypothesis rejected at 0,01 significance level, ** null hypothesis rejected at 0,05 significance level, * null hypothesis rejected at 0,1 significance level

[b)] Dummy for procurement procedure type

Let us consider the factors influencing the contract price of one kilogram of sugar. The results of assessment of various specifications of relevant models are presented in Table 3. For e-auctions and requests for quotations, increases in the contract volume lead to lower prices (though this effect disappears in the model with a dummy variable for belonging to different groups of value instead of volume in kilograms). For void e-auctions volume has no significant influence on the price. The duration of the contract is significant in five of the six estimated models, and for e-auctions the growth of contract the price increases, while for contracts placed by void e-auctions the price decreases. This may be due to the absence of competition in e-auctions, but additional research is necessary to verify this hypothesis. At the same time, for requests for quotations the coefficient of the corresponding regressor is significant only at a significance level of 0.1, and only in the specification of the model with the contract volume as a covariate.

The number of participants in the procurement procedure has a significant impact on the price. Results do not allow the rejection of the hypothesis of non-linearity of this effect for requests for quotations in both versions of the model specification (with the amount of the

contract in physical and monetary terms) and for e-auctions in the model with the contract volume in terms of money. The retail regional sugar price has a positive effect on the procurement sugar price in all the models.

Table 3. Factors influencing the contract price of one kilogram of sugar[a) b)]

Regressors	(1) E-auction	(2) Void e-auction	(3) Request for quotation	(4) E-auction	(5) Void e-auction	(6) Request for quotation
Contract volume (kg)	-1,15e-05***	1,60e-06	-8,11e-06***			
	(2,72e-06)	(5,07e-06)	(1,56e-06)			
Number of participants	-0,025***		-0,035***	-0,021*		-0,037***
	(0,010)		(0,009)	(0,012)		(0,009)
Squared number of participants	0,003***		0,003***	0,002		0,002**
	(0,001)		(0,001)	(0,001)		(0,001)
Contract duration	2,49 e-04***	-2,82 e-04**	7,99e-05*	2,37 e-04***	-2,784 e-04**	5,63e-05
	(6,39e-05)	(1,197 e-04)	(4,46e-05)	(6,56e-05)	(1,17 e-04)	(4,54e-05)
Standardized average regional price	0,412***	0,969***	0,446***	0,385***	0,960***	0,439***
	(0,052)	(0,143)	(0,036)	(0,055)	(0,1382375)	(0,036)
Dummies for a month	yes	yes	yes	yes	yes	yes
Contract value from 100 to 500 thousands rubles[c)]				-0,007	0,017	-0,003
				(0,020)	(0,023)	(0,009)
Constant	0,474***	-0,156	0,532***	0,489***	-0,011	0,534***
	(0,052)	(0,137)	(0,037)	(0,056)	(0,130)	(0,038)
Number of observations	839	310	1 460	839	310	1 460
R^2	0,469	0,774	0,211	0,454	0,776	0,200

a) * significant at 0,01; ** significant at 0,05; *** significant at 0,1
b) the robust standard errors of the coefficients are in brackets
c) dummy variable

Table 4 presents the results of the modeling of the contract price reduction compared to the starting (maximum) price. The volume of the contract has a significant influence on price reduction. In the models with dummy variables for contract value, the influence of the contract value is significant only in the models for requests for quotations. For e-auctions there is a significant positive influence of contract volume. For requests for quotations there is a negative influence. Contract duration also has a significant impact on the size of the price reduction, for requests for quotations an increase in duration leads to a bigger price reduction, for e-auctions, it lowers the price decrease. The number of bidders has a significant influence on the magnitude of

the price reduction, and in this case, the hypothesis of non-linear relationship between the size of the price reduction and the number of bidders cannot be rejected.

In regions with higher average retail prices, the price reduction is greater for e-auctions. This can be explained by the fact that in regions with higher retail prices, participation in public procurement can be more attractive for suppliers. However, for requests for quotations the average retail price has no significant influence on the price reduction.

Table 4. Factors influencing the contract price decrease of one kilo of sugar (as %) (exclusive of single-source contracts and void auction contracts)[a) b)]

Regressors	(1) E-auction	(2) Request for quotation	(3) E-auction	(4) Request for quotation
Contract volume (kg)	8,58e-06***	-4,13e-06***		
	(2,62e-06)	(1,04e-06)		
Number of participants	0,052***	0,045***	0,049***	0,045***
	(0,007)	(0,006)	(0,008)	(0,006)
Squared number of participants	-0,003***	-0,003***	-0,003***	-2,65 e-04***
	(0,001)	(0,001)	(0,001)	(0,001)
Contract duration	-1,94 e-04***	6,74e-05**	-1,86 e-04***	6,57e-05**
	(5,30e-05)	(3,07e-05)	(5,36e-05)	(3,10e-05)
Standardized average regional price	0,227***	0,010	0,244***	0,013
	(0,031)	(0,020)	(0,030)	(0,020)
Dummies for month	yes	yes	yes	yes
Contract value from 100 to 500 thousands rubles[c)]			0,014	-0,023***
			(0,014)	(0,005)
Constant	-0,243***	0,042*	-0,251***	0,035
	(0,032)	(0,024)	(0,032)	(0,025)
Number of observations	839	1 460	839	1 460
R2	0,364	0,276	0,350	0,278

a) * significant at 0,01; ** significant at 0,05; *** significant at 0,1
b) the robust standard errors of the coefficients in brackets
c) dummy variable

The results of the modeling of the difference between the contract price and the average retail price in the region are presented in Table 5. The contract volume in this case influences the price difference only for e-auctions and requests for quotations and the value of contract does not have an impact on the price deviation. Higher contract volume leads to an increase of the price difference. For long-term contracts, prices are closer to the average regional price if the contract was placed through e-auctions or requests for quotations. The number of participants in the procurement procedure has a non-linear influence on the size of the deviation from the average regional prices only for requests for quotations. For e-auctions the number of participants in the procedure is significant and its square only for the volume of contract. For models with contract value as a regressor, only the number of participants is significant.

The influence of the average retail regional price on the contract price is important for e-auctions and requests for quotations, and in both cases, the procurement price is lower in comparison with regional price and is greater in regions with higher retail prices.

Table 5. Factors influencing the difference between the average regional price and the contract price of one kilo of sugar (as %)[a) b)]

Regressors	(1) E-auction	(2) Void e-auction	(3) Request for quotation	(4) E-auction	(5) Void e-auction	(6) Request for quotation
Contract volume (kg)	9,05e-06***	-1,86e-06	8,04e-06***			
	(2,71e-06)	(5,27e-06)	(1,52e-06)			
Number of participants	0,022**		0,034***	0,019*		0,036***
	(0,010)		(0,009)	(0,011)		(0,009)
Squared number of participants	-0,002**		-0,002**	-0,002		-0,002**
	(0,001)		(0,001)	(0,001)		(0,001)
Contract duration	-2,29 e-04***	2,592 e-04**	-7,89e-05*	-2,17 e-04***	2,565 e-04**	-5,53e-05
	(6,16e-05)	(1,156 e-04)	(4,19e-05)	(6,25e-05)	(1,135 e-04)	(4,26e-05)
Standardized average regional price	0,415***	0,049	0,355***	0,440***	0,058	0,361***
	(0,043)	(0,132)	(0,030)	(0,045)	(0,128)	(0,030)
Dummies for month	yes	yes	yes	yes	yes	yes
Contract value from 100 000 to 500 000 rubles[c)]				-0,004	-0,014	0,003
				(0,019)	(0,023)	(0,009)
Constant	-0,303***	0,001	-0,346***	-0,319***	-0,003	-0,348***
	(0,044)	(0,127)	(0,033)	(0,047)	(0,121)	(0,034)
Number of observations	839	310	1 460	839	310	1 460
R^2	0,309	0,556	0,175	0,297	0,567	0,163

a) * significant at 0,01; ** significant at 0,05; *** significant at 0,1
b) the robust standard errors of the coefficients in brackets
c) dummy variable

5. Conclusion

Our analysis reveals significant differences in the nature of the influence of the same factors on the contract price in competitive procedures and void e-auctions. Moreover, the contract price of sugar is lower in e-auctions than in requests for quotations, but higher in e-auctions compared to void e-auctions. Therefore, our first hypothesis has not been rejected and the price difference between contracts placed using e-auctions and requests for quotations may

be interpreted as a sign of the effectiveness of e-auctions. However, features of void e-auctions as non-competitive procedures should be subject to further investigation.

The assumption about the positive influence of competition during procurement has been sustained. The influence of the increase in the number of participants is more significant for less competitive procedures. This conforms to the finding of MacDonald (2002).

The third hypothesis did not find reliable proof for void e-auctions, but cannot be rejected for e-auctions and requests for quotations. For contracts placed through e-auctions and requests for quotations, the growth of the contract volume leads to a lower contract price of sugar, a higher difference between initial and contract prices and a deviation of the contract price from the regional retail sugar price.

Results for the fourth hypothesis of the impact on his long-term contract price characteristics are ambiguous. There is an increase of the contract price for long-term contracts, the price reduction is smaller for long-term contracts and contract prices are closer to regional prices for long-term contracts. For the requests for quotations the results are similar, but it is significant only in the models with contract volume as a regressor. On the other hand, an increase of the duration of the contract reduces the contract price and makes the difference between contract and regional prices higher. This result contradicts our initial proposition and requires additional analysis. In addition, the analysis reveals a number of specific features of the public procurement of sugar in Russia. One is its size and price non-homogeneity. The analysed contracts included both small shipments (18–20kg) and very large ones (up to 350t). Considerable differences in the price of one kilo of sugar were found over time and across regions, which may be a manifestation of the price fluctuations characteristic of this market.

Requests for quotations were the most common procurement method (53% of all concluded contracts). The largest contract price decrease as compared to the starting price was also registered for these contracts. Contracts from a single source represent the largest contracts in the sample (the average contract volume totaled 69,7 tonnes), and in terms of value they accounted for almost 57% of the total sugar procurement volume despite making up only 3% of the number of contracts. These findings show that effective regulations contain numerous exceptions allowing the largest shipments to evade competitive procurement.

It has also been established that the average prices under contracts were approximately 10% lower than the average regional retail prices during the same period. However, considering that the average wholesale prices in the sugar market are about 25% lower than the retail prices, the prices under contracts are generally above wholesale prices. Therefore, the effectiveness of the placement of contracts based on price differences with the regional average is achievable only for contracts of small volumes.

Regulators, therefore, ought to consider the costs of procurement procedures and how to reduce them. A good example of this sort of analysis is the report prepared by PricewaterhouseCoopers for the European Commission in 2011 (PwC, 2011). It would also be expedient to monitor important markets using indicators which detect potential collusions.

In conclusion, we would like to note that our findings and recommendations are based on data for the procurement of only one product which restricts possible generalisations.

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Appendix 1. Main Characteristics of the Sample

Table P1. Characteristics of different value groups of contracts

Contract value	Number of contracts	Share of contracts (%)	Average standardized contract price of one kilo of sugar	Average standardized starting (maximum) contract price of one kilo of sugar	Average decrease of the standardized price*	Average difference of the contract price from standardized average regional price**
Up to RUR 100 000	2 229	81,95	0,900	1,015	0,102	0,076
From RUR 100 000 to 250 000	346	12,72	0,904	1,024	0,111	0,104
RUR 250 000 and more	145	5,33	0,955	1,033	0,072	0,062
All contracts	2 720	100	0,903	1,017	0,101	0,132

* As a proportion of the standardized starting (maximum) contract price.
** As a proportion of the standardized average regional price.

Table P2. Characteristics of contracts placed by different methods

Procurement method	Number of contracts	Share of contracts (%)	Total procurement volume (t)	Total procurement volume (million rubles)
Single source	81	2,98	5 647	253,8
Void auction	316	11,62	548	20,8
Auction	863	31,73	2 257	79,9
Request for quotations	1 460	53,68	2 820	93,2
All contracts	2 720	100	11 272	447,8
Procurement method	Average standardized price (kg)	Average drop in the standardized price*	Average price deviation from the standardized average regional price**	Median number of participants
Single source	1,015	0,009	0,002	1
Void auction	0,920	0,001	0,043	1
Auction	0,915	0,095	0,067	3
Request for quotations	0,887	0,132	0,098	3
All contracts	0,9034131	0,101	0,079	3
Procurement method	Average contract size (kg)	Average contract value (million rubles)		

Single source	69 721	3 126 378		
Void auction	1 734	65 904,31		
Auction	2 615	92 141,26		
Request for quotations	1 931	63 851,12		
All contracts	4 144	164 265,80		

* As a proportion of the standardized starting (maximum) contract price.

** As a proportion of the standardized average regional price. Positive value means that the contract price is lower than the average regional price.

Table P3. Characteristics of contracts of different terms

Term of delivery	Number of contracts	Share of contracts (%)	Total procurement volume (t)	Total procurement volume (million rubles)
Up to 100 days	1 336	49,12	2 562	88,4
From 100 to 200 days	974	35,81	1 705	57,7
Over 200 days	410	15,07	7 004	301,6
All contracts	2 720	100	11 272	447,8
Term of delivery	Average standardized price (kg)	Average drop in the standardized price*	Average price deviation from the standardized average regional price**	Median number of participants
Up to 100 days	0,890	0,122	0,080	3
From 100 to 200 days	0,907	0,087	0,087	3
Over 200 days	0,942	0,070	0,055	2
All contracts	0,903	0,101	0,079	3
Term of delivery	Average contract size (kg)	Average contract value		
Up to 100 days	1 918	65 977,22		
From 100 to 200 days	1 751	59 287,94		
Over 200 days	17 084	733 929,10		
All contracts	4 144	164 265,80		

* As a proportion of the standardized starting (maximum) contract price.

** As a proportion of the standardized average regional price. Positive value means that the contract price is lower than the average regional price.

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