Cross regional comparison of the efficiency of public procurement in Russia[i]

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The main goal of the paper is to assess the impact of the quality of regional institutional environment on the efficiency of public procurement system. We study the variation in the relative prices for the gasoline procured by Russian regional governments in several regions. The difference between the price of the public contract and the retail price of the simple search good (gasoline) is considered an indicator of system efficiency. We focus our research agenda exploring the possible dependence of relative price variation not only on the market characteristics (level of competition), the characteristics of the procurement (the volume and duration of the contract, type of the procurement procedure), and the type of delivery mechanism, but also on the institutional factors such as the level of information transparency in the system etc. We show that transparency of information on regional public procurement, together with the level of competition, the type of procedure and type of the delivery plan, have a significant impact on the procurement system efficiency.

Keywords: public procurement; auctions; transparency; efficiency

1 Introduction

Public procurement accounts for 5 to 15 % of the gross regional product for various Russian regions. Some of the regional development activities such as road construction, or public health and education systems are financed solely through public procurement. Hence the efficiency of regional public procurement systems is an important issue. While efficient public procurement should account both for price and quality of the goods, works or services, analysis of cost efficiency of the procurement of standardized goods (such as office supplies, gasoline, simple medicine etc.) can provide a good proxy for the overall efficiency of the system. Although private markets for such

standardized goods exist and the average market price is accessible to the procurer, the public price may vary significantly from region to region and even from contract to contract[v].

Recent studies suggest different explanations for this variation as well as for the difference between the public and market price of the good. Firstly, government procurers may face different levels of competition for each contract. Within one region or one government body the number of bidders for each contract for a given standardized good may vary. The number of bidders is positively correlated with a possible price discount. Bulow and Klemperer (1996) mention that increasing the number of bidders in both sealed bid and open bid procedures should lower the price of the contract. Even a simple open bid auction with $N+1$ bidders is preferred to any other procedure (including negotiations) with N bidders. When we compare the prices across regions not only the level of competition within each procurement procedure but also the level of competition in the "outside" market may vary. For example, the oligopolistic structure of the gasoline market is prone to collusion and is supposed to increase the price of goods procured by the government (Stenbacka, 1990).

The second source of variation is associated with the type of procedure used to procure a given standardized good. When the number of potential bidders is limited the choice of procedure should account for the market structure, frequency of procurements etc. For example, in the presence of collusive bidding sealed bid procedures should generate lower prices than the open bid procedures (Robinson, 1985). At the same time open bid procedures may generate lower prices if the bidders are "fighting" for the market share through winning government contracts.

The difference between the retail price of a standardized good and a "public" price per unit may also depend on additional features and service included in the government contract price, but not included in retail price. For example, retail prices of the goods usually do not account for transportation costs, if the gasoline is not delivered through gasoline stations, and the risks and benefits of long-term agreements. The presence of additional transportation costs may also limit the entry for the firms outside the region and limit the competition for the contract. Long-term agreements may present both

the risks of running out of capacity or the risk of price changes within the duration of the agreement and the benefits of ensuring future sales through public contracts (Jofre-Bonet, Pesendorfer, 2000).

Finally, apart from the characteristics of the procurement procedure, market structure and the public contract at hand, certain institutional factors, such as transparency of the system, quality of contract enforcement in the region, accountability of local officials etc. may alter the relative price of the good. Increasing transparency of the public procurement system should attract additional bidders, facilitate the work of enforcement agencies, hinder collusion and corruption and hence reduce the relative price of the good (Ohashi, 2009). The presence of imperfect enforcement creates incentives to bid more aggressively (to over-report the prospected quality of the supplied good or to under-report its price, Doni, 2006). High level of accountability hinders corruption and thus should lower the "public" price of the good.

To address the issue of the cost efficiency of public procurement for standardized goods we study the variation in the prices of government contracts for gasoline in ten Russian regions. These regions differ in the level of information transparency and the level of perceived corruption. So we test the hypothesis of the positive influence of the level of institutional development of the region on the public procurement efficiency.

2 The characteristics of the gasoline markets in the selected regions

The outcomes of public procurement procedure – that is the price of the procured good and the probability of contract breach (the quality of the good or the duration of the contract) – depend not only on the public procurement procedure and the procurement laws, but also on the characteristics of the market that may to a considerable extent influence the efficiency of public procurement. Among these characteristics we should list the number of potential suppliers and the level of concentration in the market, the type of the good, and the regulation of the market for this good.

The type of the good

The gasoline market was chosen for the analysis for several reasons. First of all, it is an example of the standard goods, which means that there is not much difference between the gasoline of certain type supplied by different companies. We may be sure that difference in price between different suppliers does not reflect the quality of the product or the variations in its characteristics. Moreover, that implies that the quality of the good may be controlled quite easily.

The regulation of the market

In Russian Federation the gasoline prices are normally not regulated by the government (the mining, on the contrary, is regulated). However, as the gasoline is considered to be the socially important product, the Federal Antimonopoly Service (FAS) monitors the gasoline prices in Russian regions. The justification for such monitoring may be found in the structure and specific features of the Russian oil and gasoline production:

- the industry is vertically integrated: even the gasoline stations, which in many countries are independently owned, in Russia are operated by the large vertically integrated companies;
- the distribution process is not transparent and the delivery chains may be very long and complicated[vi];
- the gasoline prices in Russia do not follow the world trends of oil prices: even when the oil prices go down, the gasoline prices in Russia continue to rise.

Thus, up to this moment, the main goal of the government regulation in gasoline sector was to promote competition at least at the retail level. When the level of competition was considered too low (and the resulting gasoline prices too high), the government was engaged in tacit price control of the market by issuing warnings to the companies. Recently, however, as these measures of promoting competition did not prove to be very effective, a move towards more regulation in the

industry was planed. The proposed measures include the calculation of the standard price for the gasoline, which will be used for the public procurement contracts as well, as the basis for the estimation of the start price, and the limits on the share of regional retail market for a single firm.

The number of suppliers

Both the situation with a few large suppliers as well as with too many small suppliers may constitute the possible threats to the efficiency. When the market tends to be oligopolistic (one or several large suppliers) the problems may arise because the firms are able to influence the price, and thus goods may be sold at higher prices. Conversely, when there are too many firms, there is a risk of awarding a contract to the firm, which is not able or not willing to supply the goods of required quality in due time. According to the report[vii] of the Federal Antimonopoly Service of the Russian Federation in more than 50 of the Russian regions the market share of the largest company in the region is more than 35%, and it is up to 50-60% in 30% of the regions. The number of the companies with a market share more than 35% in the selected regions reported by the Federal Antimonopoly Service, along with the total number of bidders in the gasoline procurement procedures and the largest public procurement market shares are presented in Table 1.

Table 1: Regional gasoline companies

Region	Number of companies with 35-50% market share	Number of companies with >50% market share	Total number of suppliers in the public procurement market	Largest shares of public procurement market
1	0	0	34	53%
2	1	1	14	63%
3	0	0	7	87%
4	1	0	14	82%
5	0	1	27	35% and 44%
6	1	1	118	39%
7	0	1	19	91%
8	0	1	54	23%
9	1	4 (different geographical markets)	30	17% and 16%
10	3	0	32	34%

3 The data

By the Federal Law №94, introduced in 2005, public officials responsible for the public procurement implementation were obliged to the publish calls for bids and the protocols documenting the main results of the procedure at the designated web sites at the federal, regional, and in some cases municipal level. We used the regional public procurement web sites of ten Russian regions to collect information on all the public purchases of gasoline which took place in these regions in 2009 and 2010. Most of the procurements were carried out by the Public Procurement Agency of each region, but there were also a few procurements initiated by the buyers (other public agencies or government organizations, for example, hospitals) themselves. Public Procurement Agency may aggregate the needs of other public bodies in the single procurement procedure or announce separate procedures for each buyer if additional need in gasoline for some public agency arises, or the initial plan was not correct. The analysis of the documentation, published at the web sites, resulted in the data set that consists of information on 1004 public procurements of gasoline completed during this period.

As a result, for every procurement we have collected the information on:

- Start (reserve) price: the information on start price is available for all the procurements published at the web site. FL94 does not specify how the start price is to be determined, so the procurer may set it at a significantly higher (or lower) level than it is feasible due to lack of information or for opportunistic reasons.

- The type of procurement procedure: the gasoline contracts are awarded via sealed bid auctions or the open bid auctions. The sealed bid auctions are allowed only for the purchases of less than 500000 rubles (approximately $17500). Sometimes procurers hold open-bid auctions even for smaller purchases because it is promoted as the “best” procedure by the government officials and FAS and is expected to signal the benevolence of the procurer. As it was mentioned earlier we expect the sealed bid procedures to generate lower relative prices due to the oligopolistic structure if the market.

- Participants of the procedure: the documents contain the information on all the bidders that applied for the participation in the procedure, all the bidders that were allowed to participate and the participants who made a bid. This provided us with the information on the number of bidders and the names of the companies. This information may be used to estimate the level of competition for every procurement procedure (and thus the potential for the price decrease) and the competition level in the regional gasoline public procurement in general (on the basis of the total number of suppliers who participated in gasoline procurements in 2009 and 2010).
- The winner of the procurement procedure: as each region has one or two dominant suppliers of gasoline, it is important to understand, whether the contracts awarded to one of them lead to higher prices of procurement.
- Contract details: finally, the information on the contracts was also collected, that is the contract price, the quantity of the gasoline to be supplied, the duration of the contract, and the type of delivery (through the gasoline stations or in tanks). Some of these characteristics may hinder competition by limiting the participation to the larger firms capable of implementing large scale and long term contracts.
- Type of contract: there are two main types of the public contracts used in the regions – contracts for the supply of gasoline in tanks ("bulk contracts") and contracts for the supply of gasoline through the gasoline stations ("station contracts"). The transportation costs may influence the price of the "bulk contracts", but it is unlikely to influence the price of the station contracts, at least the value of the station contracts per one liter of gasoline awarded to some supplier should not be different. Yet the price of the "station contract" is likely to include a service fee, making the relative price of these contracts higher than that of "bulk contracts".

The amount and accessibility of this information is different in the ten regions we study. Though the FL №94 introduced some measures to increase the transparency of information on public procurement the structure of the designated web sites, functions available for users, such as search options, the standard forms for the documents and protocols are not regulated by the law and are decided at the regional level. The law lists only the names of documents (calls for bids, the auction protocols, etc) that must be uploaded to the web site, and the basic information they must contain (starting price of the auction, date of the procedure etc.)[viii]. We estimated the index of transparency of information on public procurement in the end of 2010 on the basis of the data on the structure of a regional site of public procurement, information, and functions that are available. Our check list includes four groups of parameters that are important from the information transparency perspective: (1) current procurements, (2) completed procurements, (3) search functions, and (4) additional features. We build four indicators that summarize the availability of information and functions for each group of parameters. The summary statistics for the information transparency indicators for the Russian regional public procurement web-sites and the values of the indicators for the ten selected regions are presented in Table 2.

Table 2: Transparency index

	Current	Completed	Search	Additional	Total
For 83 regions					
Minimum	18.5	19.5	0	2	33.3
Maximum	40.5	42.5	8	9	83.1
Mean	33	29.5	4.3	5.8	58.4
Std. Deviation	3.95	5.08	2.04	1.72	10.73
Selected regions					
1	32	40	7.5	8	75.30
2	31	37	8	7.5	74.03
3	37	30.5	6.5	6	68.80
4	35	34.5	4	8	63.13
5	30	29	4.5	6	56,64
6	31	27.5	4.5	5	55.87
7	31.5	32	3.5	5	55.86
8	32.5	26.5	4	5	54.76
9	32	26	3	6	51.53
10	26	21.5	0	5	34.55

As transparency of information on public procurement may influence both the competition for the bid as well as the possibility of opportunistic behavior of the parties, and, consequently, the prices, we include the information on the transparency in the empirical analysis.

Together with the information on separate procurement procedures we also use the data of Russian statistics bureau for the retail prices per liter of the different types of gasoline in the selected regions in each month of 2009 and 2010. Depending on the date of auction, we calculated the value of each awarded contract on the basis of retail prices, i.e. estimated how much the same quantity of gasoline would cost in retail prices.

The ratio of contract price to retail price was used as the dependent variable in our empirical analysis. The independent variables include region (as the proxy for the level of information transparency), type of procedure (open-bid or sealed-bid), type of delivery (gasoline station or bulk), duration of the contract (days), volume of the contract (in liters), number of bidders, winner of the contract (market leader or not). We also included the cross variable of type of delivery by duration of the contract (because longer contracts with the delivery through the stations are associated with greater uncertainty and thus may require higher mark-ups in prices).

From the total of 1019 observations we excluded 15 observations for which the relation of start price to retail price was higher than 1,5. Such a relation most likely indicates that the start price was determined opportunistically or incompetently. That resulted in higher relative price (contract price to retail price) which can not be explained by selected variables.

Controlling for all the explained above factors, the price difference between the price of the public contract of gasoline and the retail price of the gasoline in the selected regions may be considered as an indicator of system efficiency.

4 Empirical results

In this section we study the relationships between the prices of government contracts related to the market prices for the same amount of gasoline and the characteristics of separated procedures and the regional institutional environment as a whole.

As more than 30% of the public procurement procedures of gasoline in our sample attract only one bidder, we start our analysis with studying the determinants of the probability of these cases on the regional and procedural characteristics. In order to do this we use the following specification:

$$\begin{aligned}\Pr ob(\textit{Number of bidders} = 1) = \Phi(&\alpha + \beta \text{Procedure} + \gamma \text{Type of delivery} + \\ &\delta \text{Market Leader Share} + \\ &\lambda \text{Procedure*Market Leader Share} + \\ &\mu \text{Duration} + \theta \text{Volume} + \\ &\vartheta \text{Corruption level} + \tau \text{Information Transp.}) + \varepsilon\end{aligned} \tag{1.1}$$

Here we suppose that the contracts of higher volume and duration should have higher probability to attract one bidder; "in bulk" contracts should have lower probability of attracting just one bidder since they could be performed by the companies who do not have sufficient amount of gas stations as well as the retail market leaders; the participation of the market leader in the public procurement procedure should generate a higher probability of attracting no other bidders, due to the nature of the rules of the open bid auctions[ix] the effect should be even stronger for them. The higher level of information transparency should be associated with lower probability of attracting only one bidder; the effect of corruption on this measure is ambiguous. The results of the probit regression discussed above are presented in the Table 3. As the "in bulk" contracts in our sample are seriously outnumbered, we also present the results for the two types of delivery separately.

As predicted, the participation of the market leader has a strong positive and significant effect on the probability of attracting no other bidders with and additional significant effect for the open bid auctions. The open bid auctions with no market leader as one of the participants has a significantly

lower probability to attract just one bidder. Surprisingly, the higher levels of information transparency generate higher probabilities to attract just one bidder to the procurement procedure. To address this issue we separate the influence of information transparency in Table 4. All the relevant components of the index generate the same result, yet the level of perceived corruption has a significant positive effect on the probability of attracting a single bidder when combined with high level of ex ante information transparency (information on current procurements) which may indicate a bias in the combinations of the levels of corruption and information transparency in our sample.

Table 3: Probability of "single bidder" procedures

VARIABLES	All procedures P(N=1)	"Station" delivery P(N=1)	"In bulk" delivery P(N=1)
Procedure	**-0.682*** **	**-0.795*** **	-0.459
	(0.205)	(0.234)	(0.542)
Type of delivery	**-0.306***		
	(0.157)		
Market leader share	**1.014*** **	**1.069*** **	0.244
	(0.156)	(0.162)	(0.643)
Procedure*MLShare	**0.839** **	**0.925** **	1.095
	(0.336)	(0.387)	(0.870)
Duration	0.000668	0.000566	0.00256
	(0.000481)	(0.000426)	(0.00255)
Volume	**4.23e-06*** **	**5.85e-06*** **	1.74e-06
	(1.50e-06)	(2.13e-06)	(2.29e-06)
Corruption perception	0.336	0.365	1.541
	(0.578)	(0.657)	(1.522)
Information Transparency Index	**0.0256*** **	**0.0275*** **	0.0184
	(0.00489)	(0.00554)	(0.0127)
Constant	-2.269***	-2.406***	-2.695**
	(0.436)	(0.505)	(1.141)
Observations	1,004	905	99

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Probability of "single bidder" procedures continued

VARIABLES	(1) P(N=1)	(2) P(N=1)	(3) P(N=1)
Procedure	**-0.551****	**-0.898*****	**-0.777*****
	(0.235)	(0.226)	(0.233)
Market leader share	**0.779*****	**1.152*****	**1.060*****
	(0.172)	(0.163)	(0.162)
Procedure*MLShare	**0.714***	**1.023*****	**0.944****
	(0.389)	(0.383)	(0.386)
Duration	0.000591	0.000592	0.000533
	(0.000448)	(0.000430)	(0.000416)
Volume	**5.31e-06****	**6.53e-06*****	**5.85e-06*****
	(2.12e-06)	(2.12e-06)	(2.12e-06)
Corruption perception	**3.060*****	0.0600	-0.246
	(0.923)	(0.647)	(0.616)
Current	**0.243*****		
	(0.0436)		
Completed		**0.0438*****	
		(0.0104)	
Search			**0.128*****
			(0.0273)
Constant	-9.529***	-2.020***	-1.136***
	(1.669)	(0.492)	(0.323)
Observations	905	905	905

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

We turn next to studying the relation between the relative price of the government contract sign as the result of the public procurement procedure, the characteristics of the procedure and the characteristics of the institutional environment in the region. We suppose that as the market is highly concentrated in all the regions in our sample, open bid auctions should provide more incentives to collude and thus generate higher prices. For the same reason the participation of a strong market leader with a high share of public procurement market should be associated with higher prices. As discussed above, long-term and "station" contracts should have higher prices than the short-term and "in bulk" contracts respectively. Higher level of competition should generate lower prices. Finally, high level of information transparency should be associated with lower prices, while high level of

perceived corruption – with higher prices. We use the following OLS specification to test our hypothesis:

$$\frac{\text{Price of the government contract}}{\text{Retail price of the contract}} = \alpha + \beta\,\text{Procedure} + \gamma\,\text{Type of delivery} + \delta N + \eta\,\text{Duration} + \mu\,\text{Market Leader Share} + \theta\,\text{Information Transparency} + \vartheta\,\text{Corruption Level} + \varepsilon \quad (1.2)$$

The results are presented in Table 5. Our procedure-specific hypothesis hold true under this specification. Yet the level of perceived corruption seems to have no significant effect on the relative prices of the government contracts and the effect of information transparency is not evident.

Table 5: Relative price of the government contracts

VARIABLES	(1) Relative Price	(2) Relative Price	(3) Relative Price
Procedure	**0.0269*** **	**0.0301*** **	0.00327
	(0.00739)	(0.00794)	(0.0252)
Type of delivery	**-0.0446*** **		
	(0.00782)		
Number of bidders	**-0.0234*** **	**-0.0226*** **	**-0.0284*** **
	(0.00330)	(0.00349)	(0.0104)
Duration	**7.13e-05*** **	**7.00e-05*** **	0.000241
	(2.12e-05)	(2.12e-05)	(0.000176)
Market leader share	**0.0190** **	0.0154	**0.0741** **
	(0.00925)	(0.00976)	(0.0326)
Information Transparency Index	0.000440	**0.000630***	-0.000499
	(0.000303)	(0.000337)	(0.000836)
Corruption perception	-0.0224	-0.0178	0.212
	(0.0376)	(0.0416)	(0.131)
Constant	0.998***	0.985***	0.865***
	(0.0298)	(0.0334)	(0.0940)
Observations	1,004	905	99
R-squared	0.124	0.100	0.198

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As with the previous case, in attempt to address this issue we study the influence of the different kinds of information on the relative prices separately. The results are presented in Table 6 and indicate that the availability of ex ante information as well as of well-functioning search functions seems to be associated with higher relative prices. At the same time the availability of retrospective information seems to have no effect on the prices suggesting that the bidders do not engage in strategic adaptive behavior and rely only on the current information, and, possibly, the information from the retail market to form their bidding strategies. The results presented in the Tables 5 and 6 also indicate that the participation of the market leader does not have stable significant effect on the prices of "station" contracts while substantially raising the prices of the "in bulk" contracts.

5 Conclusion

As the public sector is considered to be less efficient in setting the price of the standardized good than the private sector, researchers often use the private sector as a reference point to estimate the efficiency of the public sector. In this paper we have followed the same logic by estimating the relation of the prices of government contracts and the retail prices of the same amounts of gasoline. For our analysis we have used the data on relative prices of government gasoline contracts in Russian regions. Apart from considering the characteristics of the market, procurement procedure and a contract at hand we have also estimated the relation between efficiency of public procurement system of the region and the level of transparency of the procurement regional websites.

Researchers usually link transparency with the level of ex-ante competition. We show that while the well known relation between the size of the winning bid with the number of bidders, the type of the procedure used in the market prone to collusion, and the characteristics of the contract holds for the data in our sample, the level of information transparency has an additional significant and unexpected impact on the relative price of the government contract. The more transparent system is associated with lower participation in the public procurement procedures in our sample and higher prices in public sector for gasoline. Although this result generates some doubt about the importance

of transparency in public spending and public procurement, there are several counterarguments to it. Firstly, one should consider the effects of endogenous entry on the price formation. If the high level of information transparence combined with high corruption or high level of market concentration creates incentives to withhold from participation in the public procurement procedures and increases the probability of the "single bidder" procedures, it may affect prices solely through altering the number of bidders taking part in the competition. Secondly, although higher levels of information transparency are associated with higher prices in our sample, as the average price of both the "station" and "in bulk" contracts in our sample are slightly lower than the market prices (0.97 and 0.93 respectively) – it is also associated with the prices "closer to the market" hence indicating better awareness of the market situation for both the procurers and the suppliers.

Table 6: Relative price of the government contracts continued

VARIABLES	(1) Relative Price	(2) Relative Price	(3) Relative Price
Procedure	**0.0345*** **	**0.0279*** **	**0.0318*** **
	(0.00825)	(0.00787)	(0.00797)
N	**-0.0224*** **	**-0.0241*** **	**-0.0220*** **
	(0.00344)	(0.00347)	(0.00347)
Duration	**6.92e-05*** **	**7.02e-05*** **	**6.93e-05*** **
	(2.12e-05)	(2.13e-05)	(2.12e-05)
Market leader share	0.00612	**0.0172***	0.0144
	(0.0106)	(0.00974)	(0.00974)
Current	**0.00627*** **		
	(0.00241)		
Completed		0.000219	
		(0.000675)	
Search			**0.00442*** **
			(0.00165)
Corruption perception	0.0633	-0.0462	-0.0209
	(0.0579)	(0.0410)	(0.0391)
Constant	0.792***	1.029***	1.002***
	(0.0963)	(0.0334)	(0.0221)
Observations	905	905	905
R-squared	0.103	0.096	0.103

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes

[i] The study was implemented in the framework of the Basic Research Program of the Higher School of Economics in 2011.

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[v] Bandiera et al. (2008) for example discuss the variation of prices for standard office supplies purchased by government bodies in UK.

[vi] http://www.fas.gov.ru/analytical-materials/analytical-materials_22601.html

[vii] http://www.kommersant.ru/Doc/1607390?ThemeID=1273, http://www.fas.gov.ru/analytical-materials/analytical-materials_9499.html

[viii] http://www.hse.ru/data/2010/12/10/1208430758/Informationnaya%20prozrachnost.pdf

[ix] Perspective suppliers taking part in the open bid auctions first have to "sign in" for the auction, they may drop out of the competition between the date of "signing in" and the date of the actual auction. In addition, they may chose to show up to the auction and refuse to bid.

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