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TRANSACTION COSTS: A
COUNTRY-LEVEL ASSESSMENT
BASED ON MICRODATA**

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PUBLIC PROCUREMENT TRANSACTION COSTS: A COUNTRY-LEVEL ASSESSMENT BASED ON MICRODATA⁵

Public procurement cost evaluation is important both for procurement optimization at the company level and for evaluating the public procurement regulatory system. This paper presents a survey-based methodological approach to public procurement cost evaluation at the macro level. Our approach is based on a methodology for assessing the efficiency of public procurement developed by PwC for the European Union. The PwC methodology was adapted to developing and transitional economies and piloted on Russian data. Average costs of each type of procurement procedure implemented in 2016 were evaluated. A regression analysis of factors impacting public procurement cost evaluation revealed considerable differences between respondents who have and do not have experience with complex procurement procedures. Although the average overall costs of public procurements in Russia amounted to about 1% of the total value of concluded contracts, the figure stands at 6.6–8.1% for small purchases. This exceeds the economy from price decreases and calls for a need to simplify regulation of such procurements.

JEL Classification: H57, D23

Key words: public procurement; public procurement costs; public customers; suppliers.

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Introduction

Developed market economies today are characterized by a wide range of policies and competing objectives, including primary commercial goals relating to the principal need to achieve value for money, regulatory and socio-economic goals in terms of local and regional development and innovation (Erridge, 2007; Zheng et al., 2007, Pickernell et al., 2011). These include green procurement, the development of small and medium-sized enterprises (SME), and the creation of incentives for economic activity of minorities. For most developing countries the main objective of public procurement regulation is still to increase economic efficiency in the narrow sense – by reducing prices for public goods, works, services through the implementation of e-procurement and the use of competitive procurement procedures. However, the application of such procedures requires additional compliance costs with the requirements of public procurement legislation and the regulation of the procurement process. Therefore, procurement cost optimization is an important part of improving procurement efficiency in both developed and developing countries.

Such costs are borne by all participants in the procurement process, including suppliers and procurement regulators, in addition to public customers. The costs of procurement regulators and public customers are funded directly from the state budget. The costs of suppliers impact budgetary spending indirectly as suppliers include their procurement participation costs in the contract value. The amount of all these costs may exceed the anticipated positive effects of public procurement regulation. Therefore, comprehensive accounting of such costs and the elaboration of measures for their reduction are becoming an important element of procurement process optimization.

One of the key priorities of the European Commission's recent initiatives is to simplify the procurement process (*European Commission, 2015*). Specifically, new Directives provide wider opportunities and new methods of procurement, and public customers are granted wider freedom in the type and design of the process, which is more suitable for their needs. The flexibility of the European Directives on public procurements both at the selection stage and at the contract delivery stage is discussed in the paper Saussier and Tirole (2015). The authors consider these changes to be positive and economically feasible as greater freedom would lead to increased transparency and more efficient competition in the public procurement market.

Notwithstanding the increased recognition of the importance and relevance of the issue of public procurement costs, few empirical studies have been conducted to explore it. Most of the existing ones focused on assessment of the costs of an organization or project (see, e.g., *Gardenal, 2013; Jasko, Jovanovic and Cudanov, 2015; Costantino et al, 2012, Balaeva and Yakovlev, 2017*).

Only a few surveys include public procurement cost evaluation at the macro level, first of all, the study of public procurement efficiency in the EU carried out by PwC in 2011 (*PwC, 2011*).

However, such large studies assume well-developed public procurement mechanisms, data collection techniques, a sufficiently high competence level of procurement specialists, etc. These factors do not always exist in many developing and transitional economies, so simpler cost evaluation approaches and data collection methods are required. The purpose of this paper is to develop PwC's methodological approach to public procurement cost evaluation at the macro level for wider use, not only in countries with a well-functioning public procurement system, but also in countries with less developed institutions and public procurement mechanisms. In addition, the simplification of this methodology will help to reduce implementation costs.

To evaluate public procurement costs at the macro level we, like PwC, used the data from a formalized survey of customers and suppliers in a country (region). We used simpler questions on public procurement costs, which are clear to the respondents and enable us to gather relevant information in an imperfect institutional environment.

The methodological approach we developed was piloted on Russian Federation data. Average public procurement costs of customers and suppliers in the Russian Federation were measured in person-hours and in monetary terms, including the costs of each procurement procedure and their share in the total value of the contract. In addition, we used a regression analysis to identify significant factors influencing respondents' estimations of these costs.

1. Literature Review: Approaches to evaluation of procurement costs

For purposes of this paper, the public procurement costs of customers and suppliers shall mean the transaction costs at all stages of the procurement process. Transaction costs include search costs, information costs, negotiation costs and monitoring and enforcement costs (*Groth, 2008*) or the costs of researching suppliers, negotiation costs, the costs of approving and drafting the contract, quality control costs and enforcement costs (*Costantino et al., 2006*). There are many approaches to classifying transaction costs (see, e.g., *Arrow, 1969; Eggertsson, 1990; Milgrom and Roberts, 1992, etc.*). Williamson suggests dividing transaction costs into two major categories: *ex ante* costs incurred at the transaction stage preceding the formal conclusion of the contract, and *ex post* costs incurred at the post-contract stage of the transaction (*Williamson,*

1985). In accordance with the classification above, public procurement costs incurred in a customer/supplier relationship include:⁶

- *Ex ante* costs: procurement-related information search costs; procurement planning and rationale costs (only for public customers); procurement procedure preparation costs; procurement procedure administering costs; the costs of drafting and concluding the contract; the costs of conflict settlement in relation to the procurement process (participating in litigation, interaction with the regulators or negotiations between the public customer and the supplier).
- *Ex post* costs: the costs of monitoring the pace of contract delivery, contract closure (only for public customers); the costs of conflict settlement in relation to the contract delivery.

The procurement process also involves other costs not directly connected with particular procurement procedures. These include costs related to the use of resources by employees involved in the procurement process: office premises, furniture, hardware and software, and other consumables, as well as the costs of development of relevant laws and regulations governing public procurement. In addition, customers may need to upgrade the skills of their employees in charge of organizing the procurement process, which could also impose considerable costs. Although such costs impact the public customer's overall costs, they are beyond the context of its interactions with the suppliers and are not directly connected with performance of the transactions, i.e. they are not *transaction* costs. Moreover, the evaluation of the public customer's costs related to the use of material resources ensuring the procurement process has demonstrated that they constitute an insignificant share of the customer's total procurement costs (Balaeva and Yakovlev, 2017). Therefore, they are not included in the overall public procurement costs evaluation.

The idea of measuring transaction costs at the macro level was realized for the first time by Joseph Wallis and Douglas North (Wallis, North, 1988) based on US data. Their approach calculated the provisional amount of transaction costs using data obtained by monitoring public sources and extrapolating the results over the entire sector or the economy as a whole. However,

⁶ With account for Russia's specifics

such quantification of transaction costs by the aggregation method usually does not provide accurate estimates as this approach is generally based on assumptions and allowances.

A more accurate estimation of transaction costs can be produced by their direct measurement but this approach is excessively labour intensive. For example, the *Standard Cost Model Manual* (SCM) is used for determining the administrative burdens for businesses imposed by regulation and estimating the administrative costs (SCM, 2004). It is a quantitative methodology and it can be applied in all countries and at different levels. For measuring administrative costs for each administrative activity it is proposed to use three cost parameters:

- *price*: tariff and wage costs plus overhead for administrative activities done internally or hourly costs for external service providers;
- *time*: how long administrative activity takes to complete;
- *quantity*: the size of the population of businesses affected and the frequency that the activity must be completed each year.

Combining these parameters gives the basic SCM formula: Cost per administrative activity (or per data requirement) = Price x Time x Quantity (population x frequency). However, for macro-level analyses, such data collection remained laborious and not always realistic.

The most comprehensive empirical study of the costs of public procurement at the macro level was conducted by PwC (2011). The PwC study explored how the EU's current directives (Public Sector Directive 2004/18/EC & Utilities Directive 2004/17/EC) affected the public procurement system. Data on 540,000 contracts signed in 30 countries 2006–2010 and posted on the Tenders Electronic Daily online portal (<http://ted.europa.eu/TED/main/HomePage.do>) were analysed. The approach to cost evaluation consisted of measuring the labour costs of implementing individual stages of the purchasing process (Pre-award (Pre-proposal for firms); Award (Proposal for firms); Post award; Litigation and complaint (if applicable)) and their summation. The estimations of procurement costs, measured in terms of person-days, were obtained from a survey of 5,500 public customers and 1,800 suppliers. The conversion of the obtained estimates into monetary terms was performed by multiplying labour intensity estimates by the average of salary in each of the European countries under survey based on Eurostat and OECD data. This way, the researchers quantified the labour costs and the overall procurement costs, as well as the costs of each type of purchasing procedure.

According to the PwC study, procurement costs account for approximately 1.4% of overall contract value within the EU (about 5.3 billion euro in 2009). Supplier costs (including unsuccessful bidders) represent approximately 75% of total procurement costs; customer costs

represent 25%. The authors found that there was an inverse correlation between procurement costs and the values of the contracts, in other words costs are a larger share of contract value for smaller purchases. For contracts with a value close to the lower threshold under the directives (125,000 euro⁷), total costs accounted for 18–29% of the contract value, and for median contract value (390,000 euro) 6–9% of the contract value.

An approach similar to the PwC approach was used in *Costantino et al., (2006, 2009, 2012)* based on Italian data. The cost evaluation was also performed by summing the labour intensity estimates of individual stages of the procurement process obtained from interviews. However, the phase of collecting data for implementing the methodology proposed by *Costantino et al.* seems too complicated for large surveys. Therefore this methodology is applicable mainly at the micro level for an individual company or project.

A similar approach was also used for the quantitative evaluation of transaction costs of the private sector in the public procurement system in the Czech Republic (*Dufek et al., 2013*). The survey was conducted by interviewing employees of 48 suppliers of different sizes and areas of activity. The cost calculation was based on respondents' evaluations of the labour intensity of two stages of the procurement process (preparation for the procurement procedure and performance of the procedure) which were multiplied by the average salary. Pavel (*2018*) evaluated the private transaction costs of participating in tenders and the main factors impacting their value, based on questionnaire results (804 observations). An attempt to analyse the cost efficiency of the public procurement process at local level was made on Serbian data (*Jasko et al., 2015*). Administrative cost savings with the use of micro data is measured in *Singer et al. (2009)* for analysing the efficiency of a new electronic system of public procurement in Chile. In Russia Dmitrieva, Plaksin and Sinyatullina, (*2018*) proposed methodology for estimating information costs related to collecting, providing reporting forms and expenses of the government in value terms. Balaeva and Yakovlev (*2017*) presented an approach to evaluating public customers' costs which does not involve the direct measurement of the time spent on each type of activity. This approach is based on expert evaluations of the differences in labour intensity of various types of procedure with subsequent calculation of the costs of each type of procurement procedure. The methodology was piloted on procurement data of Voronezh State University (VSU) but is not applicable at the macro level. A simpler method

⁷ 125,000 euro is the minimal value of contracts for which the EU demands competitive public purchasing

based on the questioning and survey of participants in the public procurement process was used for evaluating the costs of public customers of one Russian region (*Yakovlev et al., 2018*).

The methodologies of measuring public procurement costs described above are based on approximate estimates of the labour intensity of procurement procedures (in terms of person-days or person-hours). As the labour time spent on procurement procedures is non-observable, data on its amount can only be obtained by expert evaluation from the results of in-depth interviews (if the number of respondents is small), or upon the results of a formalized survey of employees involved in the procurement process. Labour intensity can be evaluated both in respect of individual stages of the procurement process or in respect of the procurement process as a whole. Data on the average salary of employees involved in the procurement process are used for converting labour intensity evaluations into monetary terms.

2. Data and Methodology

a. Research approach

The majority of approaches to public procurement cost evaluation are mainly applicable at the micro level – to individual firms or projects (see, e.g., (*SCM, 2005; Costantino et al., 2006, 2009, 2012; Gardenal, 2013; Dufek et al., 2013*)). This is due, above all, to their detailed nature and the need to gather sufficiently fine-grained information on public procurement, which is far from always feasible at the macro level. The PwC approach, based on a large survey of public customers and suppliers, was used successfully at the macro level to measure the efficiency of public procurement in EU countries (*PwC, 2011*).

However, the PwC approach has a number of significant features. Its practical application presupposes the existence of an established regulatory system with enforcement mechanisms, providing sanctions for non-compliance. It also requires a developed infrastructure of public procurement, which makes it possible to access information on suppliers and consumers, as well as on the results of tenders and contract performance. Further, an essential prerequisite for applying this methodology based on a detailed questionnaire is a high level of compliance among customers and suppliers, in order to consider the answers objective. Another limitation imposed by the complexity of these tools is the qualification level of procurement specialists which allows them to accurately answer the questionnaire.

Many developing countries cannot meet these requirements. In the absence of basic prerequisites (i.e. the established regulatory system and enforcement mechanisms, as well as technical infrastructure), public procurement cost evaluation does not make much sense. When

enforcement mechanisms are weak, compliance with the requirements of procurement legislation becomes unnecessary, and the lack of technical infrastructure severely limits access to potential respondents. However, even with regulatory measures and technical infrastructure, developing countries often face a low level of compliance and insufficient qualifications of public procurement specialists (both customers and suppliers). In this regard, in order to assess the costs of procurement in such countries, a simpler toolkit is required – which we developed and piloted on Russian data.

As mentioned, the PwC approach evaluates the labour costs of each individual stage of the procurement process. Therefore, the respondents (customers and suppliers) should have a clear understanding of their labour costs at each stage. However, our previous studies revealed that specialists find it difficult to make accurate estimations of the labour costs at some stages of the procurement process (see, e.g., *Yakovlev and Balaeva, 2017*). Evaluating the labour costs of implementing different stages of the procurement process is practically impossible for many specialists. This is connected with the fact that such surveys are very time consuming for respondents. The public procurement process is also characterized with heterogeneity even for high-functioning public procurement systems – one and the same stage of one and the same procurement procedure may involve different labour costs depending on a whole range of factors: characteristics of the procured goods (works, services), the qualifications and experience of the procurement specialist, the specifics of a particular procurement procedure, the emergence of disputes and conflicts, and many other factors. In addition, it is easier for respondents to evaluate the overall labour costs of a procedure rather than divide it into individual stages as not all respondents have a clear understanding of what particular actions refer to what particular stage.

Therefore, we have modified the PwC public procurement cost evaluation methodology at the macro level (country, region). Our methodology is universal and can be applied in any country or region with practically no adjustments to adapt to the specifics of a relevant national (regional) public procurement system. Technical conditions for using this methodology include the availability of a database of potential respondent contacts (public customers and suppliers), the technical ability to conduct a large survey, and the availability of general statistics on procurement procedures.

b. Methodology

We propose a large online survey of public customers and suppliers as the main data collection method. This survey can use a questionnaire combining several blocks of questions concerning the labour intensity of the procurement process and other aspects of the public procurement system relevant for the survey purposes.

The method for generating the sample of respondents depends on specifics of the public procurement information system used in the country (region) under survey. For example, a database of e-mail addresses of respondents (public customers and suppliers) can be formed on the basis of the information from the official public procurement website of the country (region).

Two questionnaires are used – one for public customers and one for suppliers – with maximally symmetrical questions, which will enable an analysis of the questions from the perspectives of both sides. The questionnaires necessarily contain questions about the approximate labour intensity of various procurement procedures⁸, and possibly other questions relating to costs (e.g., the change in costs after regulatory changes) or other public procurement aspects.

The questionnaire also includes questions concerning general information about the respondent and the organization: sex, age, work experience, position, the organization's form of incorporation, regional performance (if the entity under survey covers several regions), headcount of the organization and the public procurement department. This makes it possible not only to collect data on the labour intensity of particular procurement procedures but also to reveal the dependence of this indicator on a wide range of factors.

Before bulk mailing of the questionnaires, they should be piloted with public procurement specialists.

After the large survey and the receipt of responses, data need to be prepared for further analysis. To avoid distortion of results, the obtained data is cleared of outliers. For example, responses containing unrealistic estimates of one of the questions relevant for the analysis are excluded.

The obtained information is used to evaluate average procurement costs (in terms of person-hours) for implementing each type of procedure. It should be taken into consideration that since more than one bidder participates in competitive procedures, suppliers' costs for these procedures grow in proportion to the number of bidders.

⁸ For purposes of this survey labour intensity shall mean the total time spent on performing a particular procedure by all the employees involved

The average procurement costs for each procedure are estimated in monetary terms. This indicator is calculated by multiplying the procurement cost of each procedure (in terms of person-hours) by the average salary of the public procurement employee (including the amount of compulsory insurance premiums for the employee). These data can be taken from official statistics and/or expert evaluations.

Another important characteristic of public procurement costs is the share of the cost of administering the procurement in its total value (as %). This indicator is calculated as the ratio of the costs in monetary terms to the average cost of each procurement procedure.

Using regression analysis the data obtained can be used to identify the nature of the impact on the public procurement costs by various factors: the size of the respondent's organization, its area of activity, the number of public procurement staff, region, qualification/experience of the employee, gender differences, etc.

Linear regression models of costs incurred by public customers and suppliers for all types of procedures are constructed, using as dependent variables the public customers' and suppliers' procurement costs (in terms of person-hours) of the relevant procedure.

c. Research target: The Russian public procurement system

The Russian public procurement system is currently regulated by Federal Law No. 44-FL "On the contract system in the procurement of goods, works and services for state and municipal needs." Statutory regulation covers the entire procurement cycle: planning, purchasing procedure, delivery and control. This requirement increased the costs of public procurement due to the need to comply with additional requirements. The law envisages several types of procurement procedures – competitive procedures (tenders, auctions, requests for quotations, requests for proposals) or single-source contracting (see Table 1).

Tab.1. The main public procurement procedures according to Federal Law 44-FL (as at 2016)

			Total values of procurement notices in 2016 (billion roubles)	Number of procurement notices
1.	Competitive procedures			
1.1	Auction	E-auction (in electronic form)	3,874.8	1,796,843
		Closed auction	10.2	279
1.2	Tender	Open tender	815.1	34,976

		Restricted tender	287.1	8,076
		Two-stage tender	0.5	65
		Closed tender	30.3	158
		Closed restricted tender	19.9	14
		Closed two-stage tender	-	-
	1.3	Request for quotations	66.3	415,842
	1.4	Request for proposal	109.2	11,156
2.	Non-competitive procedures			
		Single-source contracting	1,279.6	795,976
	Total:		6,493.1 (approximately USD 97 billion)	3,081,823
* The Russian Central Bank's average exchange rate in 2016 was RUB 67.2 for one USD.				

Source: drawn up by the authors based on analysis of Art. 24 of 44-FL and data (Report..., 2016).

In accordance with 44-FL, single-source contracting may be performed if competitive bidding procedures were recognized as void. The public customer may also conclude a contract without a competitive procedure if the value of the contract is less than RUB 100,000 (small purchases) and in some other cases prescribed by law.

The key distinction of competitive supplier selection are the criteria for determining the winner: the only criterion for determining the winner in auctions and requests for quotations is the price – the bidder offering the lowest contract price is the winner. In other competitive procedures for selecting a supplier – tenders and requests for proposals – price is not the only criterion for determining the winner. In restricted tenders, two-stage tenders, and e-auctions the public customer may set additional requirements to bidders (such as the availability of sufficient financial or human resources, experience, reputation).

According to the Ministry of Economic Development (*Report..., 2016*), 3,081,823 procurement notices exceeding RUB 6 trillion were posted on the official website of the Unified Information System in the 2016 reporting period. E-auction was the most popular procedure. In 2016, it accounted for 59.7% of the total volume (in monetary terms) of notices posted on the official website. Single-source contracting made up 19.7%. The share of requests for quotations was 1.0%, although the procedure seems to be simpler both for the customer (faster) and for the supplier (less paperwork required and no tender security).

The Russian legislation sets very low thresholds for making competitive purchase procedures obligatory for public customers. Public procurement regulation starts with contract values over RUB 100,000 (€ 1,335)⁹, which is 100 times lower compared to the thresholds used in the EU (see Table 2). Such low thresholds can make the activity of public customers much more complicated and entail additional costs of the procurement procedures and additional outlays.

Tab. 2. EU thresholds for public contracts from 1 January 2018 to 31 December 2019, €¹⁰

	Works	Supplies	Services		
			Social and specific services	Subsidised services	All other services
Central government authorities	5,548,000	144,000	750,000	221,000	144,000
Sub-central contracting authorities	5,548,000	221,000	750,000	221,000	

Source: Commission Delegated Regulation (EU) 2017/2365 of 18 December 2017 amending Directive 2014/24/EU in respect of the application thresholds for the procedures for the award of contracts.

In addition to low thresholds, the Russian public procurement regulation system is characterized by a large amount of regulation and the itemization of all procurement aspects, which inevitably triggers substantial costs for compliance.

d. Empirical data

Our study, conducted in 2017, was based on the results of a large online survey of Russian public customers and suppliers. The survey focused on the main problems of public procurement and on assessments of changes in procurement regulation. In addition, the survey addressed a number of special issues, including the increase in the transaction costs of public procurement.

⁹ For some categories of customers this threshold was increased to RUB 400,000 (€ 5,343)

¹⁰ The Table 2 shows that the recent amendments to EU Directives have also introduced changes between the thresholds for central government authorities (national government authorities) and sub-central contracting authorities operating at the regional and local levels.

The questionnaires contained questions about approximate labour intensity of various procurement procedures: single-source contracting – procurements from a single supplier (exceeding RUB 100,000), requests for quotations, e-auctions, open tenders, restricted tenders, requests for proposals, and two-stage tenders.

We collected information from the Russian official public procurement website www.zakupki.gov.ru to form an electronic database of e-mail addresses of public customers and suppliers (responsible persons from tender documentation for customers and from contract information cards for suppliers). To improve the quality of the sample we selected only e-mails that were used at least 10 times between January 2014 and March 2016 and at least once in 2016. This reflects the sample bias toward more experienced respondents. The database included 129,000 customers with confirmed and relevant e-mail addresses and 300,000 suppliers. The questioning of this sample was conducted at the beginning of 2017. A total of 1,251 correctly completed questionnaires were received from public customers and 721 from suppliers.

Respondents who gave unrealistic responses to one of the questions were excluded. Such outliers include respondents' statements that the number of employees involved in procurement in their organizations was 100 or more persons (7 respondents, or 0.4% of the total sample); or that they had over 10 years of experience but at the same time that they had no experience of working under previous legislation (35 respondents, or 1.8% of the total sample); or that their experience in the public procurement exceeded 25 years, which means that allegedly they were working in the public procurement system before it was created (15 respondents, or 0.8 % of the total sample). We also regarded as outliers the estimates of the costs of at least one procedure as 112 or more hours, i.e. 14 or more working days¹¹ (134 respondents, or 6.7 % of the total sample) or less than 2 hours (237 respondents, or 11.9 % of the total sample). Our sample did not include responses of representatives of specialized organizations making centralized procurements for customers (163 respondents, or 8.2% of the total sample) or “inexperienced” respondents working in the public procurement sphere for less than one year (11 respondents, or 0.6% of the total sample). As a result, the analysis of costs was based on 1,391 observations, including 849 for customers and 542 for suppliers.

¹¹ The upper threshold of 14 working days or more is due to the fact that we excluded respondents who could intentionally overestimate labour costs, e.g. to raise the significance of their own workload. The lower threshold less than 2 hours is an indicator of respondents' incompetence in estimating costs as direct contacts with procurement specialists show that this assessment cannot be realistic under any conditions.

Over half (59%) of public customers who participated in our survey represented municipal customers, 25% – regional customers, and 16% – federal customers. Small companies outnumbered large ones – almost half (45%) of the customer organizations employed up to 50 employees and only 8% had at least 501 employees. Among suppliers, 68% of respondents were entities with up to 20 employees and only 2% – with more than 250 employees. Most of the suppliers who participated in our survey represented the construction sector (27%) and trade (24%), whereas manufacturing firms account for only 8% of the sample. Over half of respondents – 56% of customers and 58% of suppliers – had experience of working with the legislation preceding 44-FL. The median employment period in public procurement for customers was 4 years, and for suppliers was 5 years. The share of males among suppliers was 59%, among customers it was 30%. The comparisons of the population with our sample are given in Tables A1–A3 of Appendix A.

The calculation of suppliers' total costs for performing one competitive procurement procedure was based on the data of the average number of bidders presented in the Report upon the results of monitoring the implementation 44-FL for 2016 prepared by the Ministry of Economic Development (*Report..., 2016*). The information on the average monthly salary of public customers was taken from Rosstat data on the average monthly nominal accrued salary of public sector employees specializing in general governance and socioeconomic matters (RUB 43,611 in 2016¹²), and for suppliers from data on average salaries of specialists and heads of tender departments in Russia (RUB 47,905 in 2016¹³). The working time fund with a 40-hour working week in 2016 was 1,974 hours¹⁴. Additional information on contract values and the numbers of different procurement procedures was used for calculating the average cost of each procurement procedure in Russia (*Report..., 2016*).

3. Results

a. Descriptive analysis

The average procurement cost of each type of procurement procedure were evaluated on the basis of data obtained from the results of a survey of public customers and suppliers concerning

¹² www.gks.ru

¹³ www.russia.trud.com

¹⁴ <http://www.consultant.ru/law/ref/calendar/proizvodstvennye/2016/>

the labour intensity of their employees, performing various public procurement procedures. Additional basic descriptive statistics are presented in Tables A4 and A5 of the Appendix.

Tab. 3. Average procurement costs of public customers and suppliers on public procurements depending on the type of procurement procedure, person-hours

Type of procurement procedure	Public customer's procurement costs of performing the procedure	Supplier's procurement costs of performing the procedure	Average number of bids	Total procurement costs of all suppliers involved in the procedure	Total procurement costs
Small purchases (up to RUB 100,000)	9.7	8.5	1	8.5	18.2
Single-source contacting (over RUB 100,000)	12.7	9.5	1	9.5	22.2
Request for quotations	17.2	10.1	1.9	19.2	36.4
E-auction	25.7	14.1	2.9	40.9	66.6
Request for proposal	18.4	12.3	1.2	14.8	33.2
Restricted tender	26.1	16.9	1.9	32.1	58.2
Open tender	25.3	18.4	2.3	42.3	67.6
Two-stage tender	28.9	24.3	4.6	111.8	140.7
On average (net of small purchases)	20.3	14.2	2.7	38.3	58.6

Source: drawn up by the authors based on analysis of Art. 24 of 44-FL and data (Report..., 2016).

Quite predictably, the least labour intensive types of procurement procedures, in respondents' estimates, are small purchases (up to RUB 100,000), for which 44-FL provides for the possibility of direct contracting without performing competitive procedures, and also single-source contacting to the value exceeding RUB 100,000. This is due to additional costs for compliance with statutory requirements for competitive procedures. In the opinion of public customers, procurement costs of conducting these procedures were 9.7 and 12.7 person-hours, respectively. Suppliers estimated the approximate average labour intensity of small purchases as 8.5 person-

hours, and of single-source contacting to the value exceeding RUB 100,000 as 9.5 person-hours. Therefore, the returns of the survey confirmed the assumption that procurements made in a non-competitive environment entail the least costs for both suppliers and customers, compared to other types of procurement procedure.

Total procurement costs of each type of procurement procedure (total procurement costs) are calculated as the sum of public customer's procurement costs and the total procurement costs of all suppliers involved in the procedure. The total procurement costs of all suppliers involved in the procedure, in turn, are calculated as the product of supplier's procurement costs and the average number of bids. According to our calculations, the total procurement costs of small purchases (up to RUB 100,000) and single-source contacting (over RUB 100,000) are also much smaller than for competitive procedures involving more than one bidder, and therefore the supplier's procurement costs grow in proportion to the number of bids. Relatively small total procurement costs are involved in two competitive procedures – request for quotations (36.4 person-hours) and request for proposals (33.2 person-hours), which is also a result of their relative simplicity and comparatively low competitiveness.

The survey results showed that tenders (two-stage tenders, open tenders and restricted tenders) and e-auctions are the most labour intensive types of procurement procedures for all respondents. In terms of the total labour intensity of those procedures, two-stage tenders are the leaders (140.7 person-hours) – having the highest average labour intensity as estimated by both public customers and suppliers, and the maximum competitiveness (4.6 bids) among all procedures. Open tenders take 67.6 person-hours, largely owing to its relatively high competitiveness (2.3 bids). E-auctions take 66.6 person-hours, which is comparable to that of open tender – the total procurement costs of both public customers and suppliers are less than in the cases of two-stage or open tenders, but competitiveness is quite high (2.9 bids). On the whole, the total labour intensity of one procurement procedure (net of small purchases) in 2016 was 58.6 person-hours, 65% of which are the procurement costs of suppliers (including the procurement costs of all the participants in the procurement).

Many respondents who made high estimations of the labour intensity of e-auctions often found it difficult to estimate the procurement costs for tenders. Specifically, respondents whose cost estimate of e-auctions was above the average, including 59% of suppliers and 75% of public customers, could not make an evaluation of the labour intensity of restricted tenders and 54% of suppliers and 81% of public customers had difficulties in estimating the costs for two-stage tenders. Presumably, these employees have no experience with different types of procurement

procedures, including competitive ones, and cannot make an adequate evaluation of labour intensity and compare them.

In our further calculations and analysis, we use the data given in Table 2 including the evaluations of both more experienced respondents (familiar with a wider range of procurement procedures, including competitive ones) and less experienced ones (who did not participate in competitive bidding). Their estimates more adequately represent the average procurement costs of all types of procurement procedures accounting for different qualification levels and experience of public procurement employees.

The data on procurement costs of different procurement procedures in terms of person-hours were used for evaluating the average procurement costs of each type of procedure in monetary terms (see Table 4).

Tab. 4. Average costs of public customers and suppliers on public procurements depending on the type of procurement procedure, RUB thousand

Type of procurement procedure	Public customer's procurement costs of performing the procedure	Supplier's procurement costs of performing the procedure	Average number of bids	Total procurement costs of all suppliers involved in the procedure	Total procurement costs
Small purchases (up to RUB 100,000)	3.4	3.2	1	3.2	6.6
Single-source contacting (over RUB 100,000)	4.4	3.6	1	3.6	8.0
Request for quotations	6.0	3.8	1.9	7.3	13.3
E-auction	8.9	5.4	2.9	15.6	24.5
Request for proposal	6.4	4.7	1.2	5.6	12.0
Restricted tender	9.0	6.4	1.9	12.2	21.3
Open tender	8.8	7.0	2.3	16.1	24.9
Two-stage tender	10.0	9.2	4.6	42.5	52.5
On average (net of small purchases)	7.0	5.4	2.7	14.6	21.6

Source: drawn up by the authors based on analysis of Art. 24 of 44-FL and data (Report..., 2016).

The average costs of one procurement procedure was about RUB 5,000 for the supplier and RUB 7,000 for the public customer. The total average costs of one procurement procedure (net of small purchases) was RUB 22,000, 68% of which are the supplier's costs (accounting for the costs of all procurement participants). In our estimates, the total costs of performing public procurements in Russia in 2016 was approximately RUB 64 billion.

The share of procurement costs in the total contract value (%) is an important characteristic of the public procurement system of the country (region). Additional information on the value of contracts and their number (*Report..., 2016*) was used for calculating the weighted-average costs for each procurement procedure. The results are presented in Table 5.

Tab. 5. Share of the public customers' and suppliers' aggregate procurement costs in the contract value, by procedure (2016), %

Procedure	Share of procurement costs in the contract value, %
Small purchases (up to RUB 100,000)	6.6
Single-source contacting (over RUB 100,000)	0.5
Request for quotations	8.3
E-auction	1.1
Request for proposal	0.1
Restricted tender	0.1
Open tender	0.1
Two-stage tender	0.6
On average (net of small purchases)	1.0

Source: drawn up by the authors based on analysis of Art. 24 of 44-FL and data (Report..., 2016).

Requests for quotations are the most expensive procedure – the share of procurement costs in the total contract value is 8.3% – way above the other procedures. Small purchases are also costly – even if we take the maximum average value (RUB 100,000), the share of procurement costs would be 6.6%. But as the actual average cost of small purchases is lower, the share of procurement cost may substantially exceed the value of this indicator for other procedures,

including requests for quotations. E-auctions can also be referred to relatively expensive procedures – their procurement costs total 1.1% of the average contract value.

As part of the survey we also asked about the threshold value of a public procurement contract for applying the statutory regulations. According to responses, a large share of public customers consider the current regulation excessive and therefore impractical. 44% of public customers consider the current regulation excessive for small purchases to the value up to RUB 100,000, 40% – for purchases to the value of RUB 100,000 to 500,000, and 30% – for purchases to the value exceeding RUB 500,000 (Fig. 1). Nearly half the suppliers also consider statutory regulation of small procurements as excessive. Specifically, 49% of suppliers consider excessive the effective regulation for small purchases to the value up to RUB 100,000, 34% – for purchases to the value of RUB 100,000 to 500,000 (Fig.2).

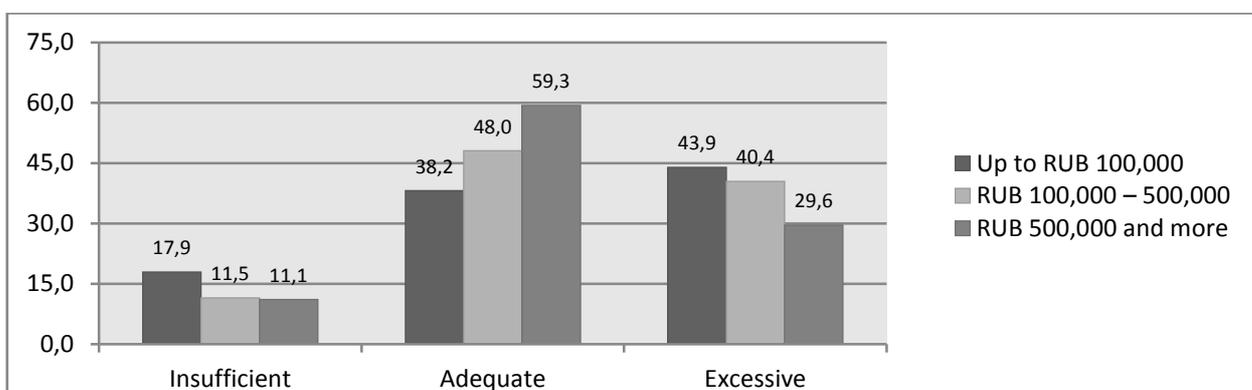


Fig. 1. Evaluation of the Russian effective regulation of procurements of different value by public customers, % of respondents

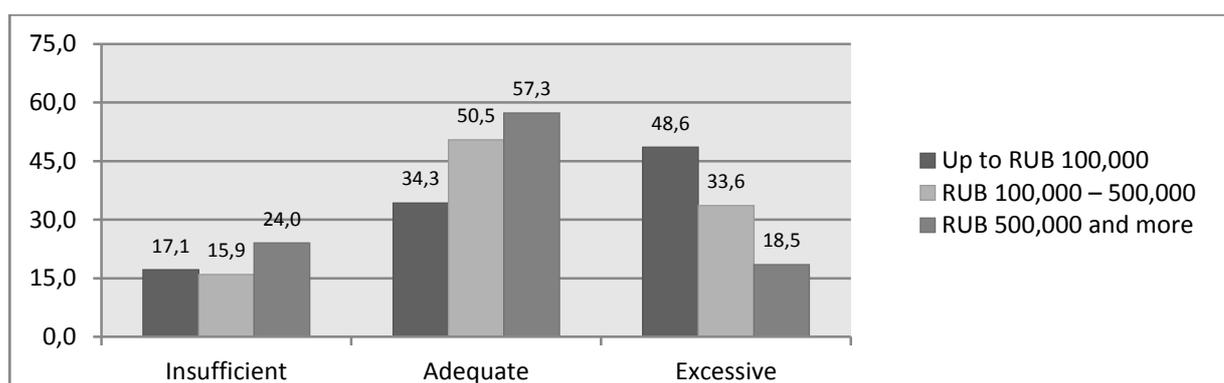


Fig. 2. Evaluation of the Russian effective regulation of procurements of different value by suppliers, % of respondents

Most public customers believe that procurement regulation should not be applied to small purchases but should start at a minimal threshold value of RUB 500,000 (44% of respondents) or RUB 1,000,000 (26%).

Such excessive regulation inevitably leads to increased costs of public procurement. These additional expenses for compliance with the statutory requirements and regulations become necessary for an increasing number of procurements. As these costs do not depend on the contract value, they are especially tangible for small contracts. Public customers are compelled to divert their limited resources from core activities and suppliers may indirectly impact the growing value of public procurement by including their procurement costs in the contract price.

b. Regression analysis

We used a regression analysis to reveal the impact of various factors such as the size of the respondent's organization (headcount), the area of activity, the approximate headcount of the public procurement department, region, respondent's qualification/experience, sex, etc., on the amount of public procurement costs.

We formed linear regression models of costs separately for public customers and for suppliers for all types of procurement procedures. Public customers' and suppliers' procurement costs for a particular procurement procedure (y_i , where i is the respondent number) were used as dependent variables. This way, we evaluated the following models:

$$y_i = c + \beta E_i + \gamma X_i + \varepsilon_i, \quad (1)$$

where E_i is the indicator of work experience with tenders. Importantly, this control variable was not included in the models where dependent variables were the costs of procurements via tenders.

The X_i vector variable stands for a combination of factors used in the model for control purposes. These factors include the respondent's age, sex, an indicator of experience under the previous public procurement regulations, an indicator of whether the respondent left his contacts for feedback,¹⁵ the organization's area of activity, the approximate headcount of the procurement department, regional control variable (GRP logarithm as an indicator of regional economic

¹⁵ Our survey was anonymous, but after completing the questionnaire the respondents were asked to leave their contact details in case they wanted to receive summary results of the survey

development). A full list and descriptive statistics of these variables are in Tables A6 and A7 of the Appendix.

Due to the continuity of the dependent variables in our analysis we used linear models estimated by the least squares method. To address the problem of heteroscedasticity we used the White estimators for standard deviations. These estimators are more robust but consistent. The estimation results are given in Tables 5–8.

Proceeding from the data, we assumed that respondents who had experience of working with complex procedures would evaluate simpler procedures as less labour intensive. Regression analysis confirmed the effect of experience of working with complex procedures on the labour intensity of other procedures. Econometric analysis revealed a number of additional effects, for example, the labour intensity estimates for requests for quotations and e-auctions by federal customers were statistically lower than municipal and regional customers (see Table 6).

Tab. 6. Model estimation results for public customers' procurement costs. All procedures except for tenders.

		Small purchases (up to RUB 100,000)	Single-source contacting (over RUB 100,000)	Request for quotations	E-auction	Request for proposal
		Dependent variable				
Characteristic of respondent/ organization/ region	Set of variables included in the model	Procurement costs for a procurement procedure				
Experience in competitive procedures		-2.4**	-3.05**	-3.13*	-3.17*	2.75
Age	21 to 30 years old	highlighted category				
	31 to 40 years old	1.64	2.35	3.55	-0.509	-0.555
	41 to 50 years old	1.85	1.48	2.96	4.68	-3.71
	over 50 years old	3.32	1.47	12.6***	11.4***	2.39
Sex	female	highlighted category				
	male	0.0307	0.249	2.96	1.07	-3.6
Position	Department head/ deputy CEO	highlighted category				
	Department head	-2.24	-0.161	1.47	0.0241	0.813
	Specialist (manager)	-1.96	1.01	3.11	-1.97	0.117

Experience in procurements under the previous procurements regulation regime		-1.96	-0.0117	-2.78	-1.04	-1.23
The respondent left contact details for feedback		-1.07	-1.3	2.24	-1.06	-1.44
Category of organization	Municipal customer	highlighted category				
	Regional customer	0.755	-1.81	-3.24	0.0422	6.42
	Federal customer	-0.385	-2.4	-5.25**	-7.27***	5.91
Approximate headcount of the procurement department	Headcount	-0.12	-0.237	-0.425	-0.298	-0.559
Organization's area of activity	Public administration	highlighted category				
	Education	1.27	-2.74	-1.57	-0.628	1.81
	Health	-2.17	-0.957	2.81	1.64	-0.538
	Law enforcement	0.0182	4.51	8.29*	7.12	4.91
	All others	1.04	2.13	4.4	6.68**	3.23
Logarithm of per capita GRP in the region		0.57	3.8*	1.79	0.42	-1.23
Constant		4.18	-34.5	-9.61	19.3	32.4
R^2		0.049	0.050	0.116	0.081	0.064
F -statistics		1.48	1.47	2.43	2.19	0.541
p-value		0.096	0.099	0.001	0.004	0.928
Number of observations		505	498	335	441	153
<i>Significance: '***' 0.01 '**' 0.05 '*' 0.1</i>						

The results showed that the customer organization's area of activity is statistically significant for all types of tenders (restricted tenders, open tenders, and two-stage tenders) (see Table 7). For example, compared to the spheres of public administration, education and health, procurement costs for tenders in other areas of activity of customers are statistically higher.

Tab. 7. Model estimation results for public customers' procurement costs. Tenders.

	Restricted tender	Open tender	Two-stage tender
	Dependent variable		

Characteristic of respondent/ organization/ region	Set of variables included in the model	Procurement costs for a procurement procedure		
Age	21 to 30 years old	highlighted category		
	31 to 40 years old	-2.22	-2.94	-3.99
	41 to 50 years old	-4.3	-2.24	-4.08
	over 50 years old	-0.472	7.45	0.934
Sex	female	highlighted category		
	male	-6.86	-3.99	0.53
Position	Department head/ deputy CEO	highlighted category		
	Department head	10.6*	1.51	1.35
	Specialist (manager)	1.81	-3.84	-4.17
Experience in procurements under the previous procurements regulation regime		-7.76*	-3.03	0.0341
The respondent left contact details for feedback		6.02	-1.15	3.77
Category of organization	Municipal customer	highlighted category		
	Regional customer	7.36	4.42	12.1*
	Federal customer	2.37	-0.251	11
Approximate headcount of the procurement department	Headcount	-0.536	-0.37	-0.618
Organization's area of activity	Public administration	highlighted category		
	Education	2.88	-2.45	3.82
	Health	8.54	-2.73	0.177
	Law enforcement	16.7*	12.8*	4.27
	All others	17.9***	6.84*	14.2**
Logarithm of per capita GRP in the region		-0.164	-0.764	-2.26
Constant		20.9	39.5	50.2
R2		0.187	0.127	0.140
F-statistics		1.65	1.595	0.903
p-value		0.067	0.074	0.569
Number of observations		132	192	106

We can see from Table 6 that customers over 50 years old make statistically higher estimations of procurement costs for all types of tenders (restricted tenders, open tenders, and two-stage tenders). A similar effect was produced for suppliers over 40 years old for all types of procedures except open tenders, two-stage tenders and restricted tenders (see Table 8). However, the age factor was insignificant for tenders (see Table 9).

Tab. 8. Model estimation results for public suppliers' procurement costs. All procedures except for tenders.

		Small purchases (up to RUB 100,000)	Single-source contacting (over RUB 100,000)	Request for quotations	E-auction	Request for proposal
		Dependent variable				
Characteristic of respondent/ organization/ region	Set of variables included in the model	Procurement costs for a procurement procedure				
Experience in competitive procedures		-3.44**	-3.13	-0.92	-2.67**	-1.38
Age	21 to 30 years old	highlighted category				
	31 to 40 years old	2.06	0.344	2.26	2.32	4.85*
	41 to 50 years old	1.16	3.14	4.09*	4.01*	1.84
	over 50 years old	0.379	0.552	1.14	2.47	-0.371
Sex	female	highlighted category				
	male	0.578	1.79	0.622	-3.1*	2.54
Experience in procurements under the previous procurements regulation regime		-0.984	-2.89*	-1.96	-0.258	-0.939
The respondent left contact details for feedback		1.57	-1.67	-2.11	-1.51	-1.29
Approximate headcount of the procurement department	Headcount	-0.0381	0.00286	0.0886	0.067	0.0761
Organization's area of activity	Construction	highlighted category				
	Industry	-1.37	-1.77	1.3	-3.17	-7.35***
	Transport	-1.18	-3.46*	-0.369	-5.1**	-3.13
	All others	0.0435	-0.203	2.28	-2.88	-2.05

Logarithm of per capita GRP in the region		-0.429	1.81	0.698	1.41	1.66
Constant		15.2	-9.61	0.684	0.851	-8.1
R2		0.036	0.055	0.030	0.038	0.053
F-statistics		1.04	1.26	0.883	1.18	1.15
p-value		0.412	0.240	0.564	0.296	0.317
Number of observations		343	272	351	369	263
<i>Significance: '****' 0.01 '**' 0.05 '*' 0.1</i>						

Tab. 9. Model estimation results for public suppliers' procurement costs. Tenders.

		Restricted tender	Open tender	Two-stage tender
		Dependent variable		
Characteristic of respondent/ organization/ region	Set of variables included in the model	Procurement costs for a procurement procedure		
Age	21 to 30 years old	highlighted category		
	31 to 40 years old	-1.34	1.83	5.38
	41 to 50 years old	-3.06	-0.315	3.85
	over 50 years old	-2.82	3.48	1.46
Sex	female	highlighted category		
	male	-1.49	2.16	3.96
Experience in procurements under the previous procurements regulation regime		3.37	0.892	1.14
The respondent left contact details for feedback		-2.48	-2.61	-3.9
Approximate headcount of the procurement department	Headcount	0.148	0.118	0.0292
Organization's area of activity	Construction	highlighted category		
	Industry	2.34	-4.66	2.05
	Transport	-5.64*	-4.31	-4.42
	All others	-2.93	-0.86	-2.64
Logarithm of per capita GRP in the region		4.22	1.48	2.17
Constant		-33.8	-0.772	-4.88
R2		0.053	0.040	0.038

<i>F</i> -statistics		0.741	0.942	0.585
p-value		0.670	0.500	0.839
Number of observations		157	259	175
<i>Significance: '***' 0.01 '**' 0.05 '*' 0.1</i>				

The regression analysis showed that the costs of e-auctions and small purchases were lower on average by 2.7 person-hours and 3.4 person-hours, accordingly, for suppliers who had experience with tenders, compared to those who had no such experience. Similar results were obtained for customers with such experience: the average procurement costs for e-auctions were 3.2 person-hours less, for small purchases – 2.4 person-hours less, and for single-source contracting and requests for quotations – 3.1 person-hours less.

Conclusion

The developed methodological approach to the evaluation of public procurement costs at the macro level was successfully piloted on Russian data. A large survey of public customers and suppliers provided a general picture of the public procurement costs of the main public procurement participants in Russia – public customers and suppliers. We believe that this approach can be recommended for the evaluation of public procurement costs in any country (region), particularly for developing countries.

In comparison with other developing countries, Russia has a higher level of implementation of e-procurement technologies and a sufficient level of enforcement of procurement regulation. At the same time, Russia is close to other developing countries in terms of the limits of the institutional environment. In order to comply with the recommendations of international organizations, developing countries are introducing e-procurement and strengthening enforcement mechanisms. Therefore, analyses of the procurement costs on Russian data can allow them to avoid the mistakes made in Russia.

According to our estimates, the total public procurement costs in 2016 were 1% of the aggregate value of contracts concluded during the year. Although this figure seems small, a more detailed analysis of the costs of particular procurement procedures and contract values has exposed a number of bottlenecks.

The results of the survey confirmed that the lower the contract value, the more expensive the implementation and administration. The most expensive procedures are small value purchases –

requests for quotations and small purchases up to RUB 100,000. The share of costs of such procurement contracts is 6.6% and more. Not surprisingly, most public customers believe that procurement regulation should not be applied to very small purchases but should start from the minimum threshold of RUB 500,000 (44% of respondents) or RUB 1,000,000 (26%). Respondents' said such excessively rigid regulation is an unavoidable consequence of the increased risk of corruption among public organizations' officials (*Büchner et al., 2008*), favoritism (*Laffont and Tirole, 1991*) and third-party opportunism (*Moszoro and Spiller 2012; Moszoro et al, 2016*). Third-party opportunism emerges when top-level bureaucrats try to guarantee themselves against all sorts of accusations of inefficiency by adhering to excessively rigid rules which in itself reduces efficiency (*Moszoro and Spiller 2012; Moszoro et al, 2016*).

The share of procurement costs in the overall contract value in Russia (1%) is similar to in the EU (1.4%). However, it is hardly possible to compare these parameters for the EU and Russia as public procurement regulation in the EU differs from the Russian regulation: the average contract value in the EU is many times higher than in Russia and the difference in salary of public procurement specialists is very significant. However, if we leave the value indicators aside and focus on procurement costs (in terms of person-hours) we can see that they are quite comparable. According to PwC data, a public customer's procurement cost of holding an e-auction is 28 person-hours, a supplier's procurement costs is 12 person-hours. According to our estimates for Russia, a public customer's procurement cost is 26 person-hours; a supplier's procurement cost is 14 person-hours. The structure of the overall costs of public procurement is also comparable to the PwC data. In our estimations, supplier costs (taking into consideration all participants' costs) account for 68% of the total procurement costs, according to PwC data – 75%. To improve the validity of proposed methodology, it would be certainly useful to verify the comparability of PwC estimates with those obtained using our methodology on the same EU data. This could be a limitation of this study and a direction for future research.

An analysis of labour intensity depending on a whole range of factors characterizing the respondent and their organization using econometric methods revealed only a few significant factors. The main one is the respondent's experience with complex procedures – these respondents gave lower estimates of procurement costs for simple procedures. In addition, the respondent's age, the area of the organization's activity and the organization being a federal/municipal/regional customer were statistically significant factors for some procedures. Factors such as sex, position, experience of working under previous public procurement regulation, an indicator of whether the respondent left his contacts for feedback, an approximate headcount of the procurement department, a regional control variable are statistically

insignificant for practically all procedures. This result may be connected with the particularities of our sample (as mentioned, it is biased toward more experienced respondents, sufficiently well integrated into the Russian public procurement system).

Other limitations of our research include respondents' bias toward *ex ante* costs. To facilitate the questionnaire our questions did not anticipate *ex post* costs related to contract performance monitoring, contract closure, and possible complaint resolution. With subsequent research to evaluate the full cycle of the transaction costs of public procurement it will be necessary to clearly explain to respondents which particular stages of the procurement process are included in the concept of labour intensity to be evaluated. The results showed that the respondents would need more detailed instructions on filling out questionnaires concerning labour intensity of each type of procurement procedure, which could reduce the number of unrealistic assessments.

Nevertheless, we can confidently state that this approach to the evaluation of public procurement costs is feasible and relatively inexpensive. It is recommended for use on large datasets making possible the analysis of public procurement costs by countries (regions). These can be developing countries, transition economies with an immature system of public procurement regulation, or developed countries and regions where it is necessary to evaluate the effectiveness of public procurement system quickly and without substantial labor costs. Such a study can serve as a basis for developing recommendations on improving public procurement system of any country (region).

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Tab. A1. Comparison to the population by subordination level of public customers

Subordination level	Sample	Population
Federal	0.19	0.09
Regional	0.25	0.18
Municipal	0.55	0.73

The population parameters are based on the analysis of the list of organizations published on the official website of Russian public procurement zakupki.gov.ru (zakupki.gov.ru/epz/organization). About one per cent of the respondents in the sample did not state the subordination level of their organization.

Tab. A2. Comparison to the population by female representation with respect to organizations' field of activity

Activity	Sample	Population
Public customers		
Education	0.798	0.832
Health and social services	0.769	0.791
Public administration	0.595	0.415
Suppliers		
Construction	0.260	0.142
Trade	0.505	0.636
Industry	0.333	0.400

The table gives comparison of the share of women in the sample (the second column) to that of the population (the last column) with respect to organizations' field of activity, which is given in the first column: *Education, Health and social services, Public administration, military security and social insurance, Construction, Trade, Industry* (Federal State Statistics Service, 2017, p. 52).

Tab. A3. Comparison to the population by age (with respect to organizations' activity)

Age group	Sample	Population
Public customers		
<i>Education</i>		
Under 21	–	0.001
21 – 30	0.134	0.157
31 – 40	0.283	0.247
41 – 50	0.349	0.265
51 and over	0.234	0.330
<i>Health and social services</i>		
Under 21	–	0.001

21 – 30	0.170	0.155
31 – 40	0.445	0.230
41 – 50	0.259	0.271
51 and over	0.126	0.342
<i><u>Public administration</u></i>		
Under 21	–	0.016
21 – 30	0.105	0.248
31 – 40	0.389	0.315
41 – 50	0.311	0.226
51 and over	0.195	0.195
Suppliers		
<i><u>Construction</u></i>		
Under 21	–	0.005
21 – 30	0.128	0.218
31 – 40	0.383	0.302
41 – 50	0.219	0.229
51 and over	0.270	0.245
<i><u>Trade</u></i>		
Under 21	–	0.006
21 – 30	0.192	0.260
31 – 40	0.266	0.306
41 – 50	0.345	0.228
51 and over	0.197	0.200
<i><u>Industry</u></i>		
Under 21	–	0.003
21 – 30	0.089	0.196
31 – 40	0.286	0.277
41 – 50	0.321	0.235
51 and over	0.304	0.289

The table gives comparison of the age distribution in the sample (the second column) to that of the population (the last column) with respect to organizations' field of activity, which is given by three blocks: *Education, Health and social services, Public administration, military security and social insurance, Construction, Trade, Industry* (Federal State Statistics Service, 2017, p. 59). For the sample parameters, the category for age no more than 20 is missing due to the formulation of the question about age. Also, for the population parameters, the age categories are given as "15-19", "20-29", "30-39", "40-49", "50-72", which are very close to the sample's age categories, so the categories were matched with small errors.

Tab. A4. Descriptive statistics for public customer's procurement costs of performing the procedure

Type of procurement procedure	Mean	Standard deviation	Median	Min	Max	Skewness	Kurtosis
Small purchases (up to RUB 100,000)	9.7	13.6	5.0	2.0	100.0	4.05	20.15
Single-source contacting (over RUB 100,000)	12.7	15.9	8.0	2.0	100.0	3.24	12.64
Request for quotations	17.2	16.1	10.0	2.0	100.0	2.21	6.47
E-auction	25.7	22.8	18.0	2.0	100.0	1.43	1.49
Request for proposal	18.4	19.4	10.0	2.0	100.0	2.07	4.55
Restricted tender	26.1	22.3	20.0	2.0	105.0	1.29	1.26
Open tender	25.3	19.9	20.0	2.0	98.0	1.11	0.61
Two-stage tender	28.9	24.4	20.0	3.0	100.0	1.26	0.86

Tab. A5. Descriptive statistics for public supplier's procurement costs of performing the procedure

Type of procurement procedure	Mean	Standard deviation	Median	Min	Max	Skewness	Kurtosis
Small purchases (up to RUB 100,000)	8.5	11.7	4.0	2.0	100.0	4.1	23.0
Single-source contacting (over RUB 100,000)	9.5	12.7	5.0	2.0	89.0	3.7	16.0
Request for quotations	10.1	13.4	5.0	2.0	100.0	3.8	17.5
E-auction	14.1	15.4	8.0	2.0	100.0	2.6	8.4
Request for proposal	12.3	14.7	6.0	2.0	100.0	2.9	10.6
Restricted tender	16.9	17.3	10.1	2.0	100.0	2.3	6.3
Open tender	18.4	17.7	12.0	2.0	100.0	2.1	5.5
Two-stage tender	24.3	21.4	20.0	2.0	100.0	1.6	2,4

Tab. A6. Description of control variables used in the procurement costs model of public customers

Characteristic of respondent/ organization/ region	Set of variables included in the model	Median	Standard deviation
Experience in competitive procedures		0.32	0.47
Age	21 to 30 years old	0.13	0.34
	31 to 40 years old	0.34	0.47
	41 to 50 years old	0.33	0.47
	over 50 years old	0.20	0.39
Sex	female	0.73	0.45
	male	0.27	0.44
Position	Department head/ deputy CEO	0.22	0.40
	Department head	0.27	0.44
	Specialist (manager)	0.51	0.50
Procurement experience under Law 94-FL		0.57	0.50
The respondent left contact details for feedback		0.61	0.49
Category of organization	Municipal customer	0.59	0.50
	Regional customer	0.25	0.43
	Federal customer	0.16	0.36
Approximate headcount of the procurement department	Headcount	2.36	3.71
Organization's area of activity	Public administration	0.12	0.32
	Education	0.36	0.48
	Health	0.13	0.33
	Law enforcement	0.05	0.21
	All others	0.34	0.47
Logarithm of per capita GRP in the region		13.01	12.95

Tab. A7. Description of control variables used in the procurement costs model of suppliers

Characteristic of respondent/ organization/ region	Set of variables included in the model	Median	Standard deviation
Experience in competitive procedures		0.53	0.5
Age	21 to 30 years old	0.14	0.35
	31 to 40 years old	0.31	0.46
	41 to 50 years old	0.29	0.45
	over 50 years old	0.36	0.44
Sex	female	0.41	0.49
	male	0.59	0.49
Procurement experience under Law 94-FL		0.59	0.49
The respondent left contact details for feedback		0.75	0.44
Approximate headcount of the procurement department	Headcount	5.45	9.58
Organization's area of activity	Construction	0.27	0.44
	Industry	0.09	0.26
	Transport	0.23	0.43
	All others	0.41	0.49
Logarithm of per capita GRP in the region		13.09	12.80

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