

## Artículo de investigación

# The access of russian small enterprises to public procurement markets: data analysis

El acceso de las pequeñas empresas rusas a los mercados de contratación pública: análisis de datos

Acesso das pequenas empresas russas aos mercados de contratos públicos: análise de dados

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## Abstract

The aim of this study was to assess the current extent of participation by Russian small enterprises in regional public procurement. We discussed how legislation affects the volume of contracts awarded to small enterprises. We calculated the number of contracts per 100 small enterprises, how much the number and value of such contracts account for in the total number and value of contracts concluded with all suppliers per region, as well as what is the average value of contracts per small enterprise and the average value of one such contract. In order to ensure benchmarking for enterprises located in different regions, such enterprises were assessed on the basis of relative indicators. This study used official statistics accumulated with regard to all public procurement in the regions. The data on the number of contracts and their value for the period from 2010 to 2014 were used. For the purposes of empirical data analysis, the normal distribution probability density functions set for all the indicators in question were used. The findings of this study and

## Resumen

El objetivo de este estudio fue evaluar el grado actual de participación de las pequeñas empresas rusas en la contratación pública regional. Discutimos cómo la legislación afecta el volumen de contratos adjudicados a pequeñas empresas. Calculamos el número de contratos por cada 100 pequeñas empresas, cuánto representan el número y el valor de dichos contratos en el número y el valor total de los contratos celebrados con todos los proveedores por región, así como también cuál es el valor promedio de los contratos por cada pequeña empresa y el valor promedio de uno de esos contratos. Con el fin de garantizar la evaluación comparativa para las empresas ubicadas en diferentes regiones, dichas empresas se evaluaron sobre la base de indicadores relativos. Este estudio utilizó estadísticas oficiales acumuladas con respecto a todas las contrataciones públicas en las regiones. Se utilizaron los datos sobre el número de contratos y su valor para el período de 2010 a 2014. A los efectos del análisis de datos empíricos, se

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the tools used for assessing the extent of participation by small enterprises in public procurement can be used when researching entrepreneurship, as well as to justify the contract system development programs in Russia. Such information is important for entrepreneurs, as it enables them to assess the feasibility and consequences of participation in public procurement.

**Keywords:** Small companies, public contracting, suppliers, market participation.

utilizaron las funciones de densidad de probabilidad de distribución normal establecidas para todos los indicadores en cuestión. Las conclusiones de este estudio y las herramientas utilizadas para evaluar el grado de participación de las pequeñas empresas en la contratación pública se pueden utilizar al investigar el espíritu empresarial, así como para justificar los programas de desarrollo de sistemas contractuales en Rusia. Dicha información es importante para los empresarios, ya que les permite evaluar la viabilidad y las consecuencias de la participación en la contratación pública.

**Palabras claves:** Pequeñas empresas, contratación pública, proveedores, participación en el mercado.

## Resumo

O objetivo deste estudo foi avaliar o atual grau de participação das pequenas empresas russas nas compras públicas regionais. Discutimos como a legislação afeta o volume de contratos concedidos a pequenas empresas. Nós calculamos o número de contratos por 100 pequenas empresas, que representam o número eo valor desses contratos no número total eo valor total dos contratos com todos os fornecedores por região, bem como o que o valor médio de contratos para cada empresa de pequeno porte e o valor médio de um desses contratos. Para garantir benchmarking para empresas localizadas em diferentes regiões, essas empresas foram avaliadas com base em indicadores relativos. Este estudo utilizou estatísticas oficiais acumuladas em relação a todas as compras públicas nas regiões. Foram utilizados os dados sobre o número de contratos e seu valor para o período de 2010 a 2014. Para fins de análise empírica dos dados, foram utilizadas as funções de densidade de probabilidade de distribuição normal estabelecidas para todos os indicadores em questão. As conclusões deste estudo e os instrumentos utilizados para avaliar o grau de participação das pequenas empresas nos contratos públicos podem ser utilizados na investigação do empreendedorismo, bem como para justificar os programas de desenvolvimento de sistemas contratuais na Rússia. Esta informação é importante para os empresários, pois permite avaliar a viabilidade e as consequências da participação em contratos públicos.

**Palavras-chave:** Pequenas empresas, contratação pública, fornecedores, participação no mercado.

## Introduction

In recent years, facilitating the access of small businesses to public procurement markets has been one of the important areas of competition development in the Russian economy. Public procurement is a strategic function of economic management because of the huge volume of resources consumed, as well as the important political objectives such purchases seek to achieve. One of the objectives of "Development strategy for small and medium-sized enterprises in the Russian Federation for the period up to 2030" (Strategy of SME, 2017) is boosting the volume of goods, works and services purchased from small enterprises.

Small businesses in Russia include both legal entities and self-employed entrepreneurs (sole traders). The current criteria for classifying economic entities as small and medium-sized enterprises were established in Federal law No. 209-FZ dated 24.07.07 (Federal law, 2007). The main criterion is the number of employees, which for a small enterprise should not exceed one hundred people. The additional criteria are how much of an enterprise is owned by federal and municipal governments (maximum stake – 25%), as well as revenue from the sale of goods (works, services) and the carrying value of its assets. The maximum values of the last two criteria are set by the government and are adjusted annually if needed.

Public procurement is an essential element in supporting small businesses in Russia. How small enterprises were to participate in public procurement until the end of 2013 was regulated by Federal Law No. 94-FZ dated 21.08.2005. From 2014 onwards, it is regulated by Federal Law No. 44-FZ dated 05.04.2013. In accordance with this law, Russia has established a contract system for the procurement of goods, works and services for state needs. The main issues addressed by the contract system is the development of competition, the saving of costs and the elimination of corruption. In addition, the contract system serves as an essential element of support for small businesses. For this purpose, it provides a set of procedures aimed at ensuring the participation of small enterprises in procurement and implementation of contracts for the supply of goods, works and services for the state needs of Russian regions (González & Antúnez, 2016).

Currently, in Russia there are over 5 million small businesses, employing 15 million people (21% of the total number of jobs in the country). Small enterprises account for 17% of Russia's GDP. For comparison with other countries, it can be noted that the small business sector creates 45% of jobs and generates 33% of GDP in developing countries, and 62% and almost 64% in developed countries, respectively (International, 2010; European Commission SMEs access to public markets, 2016). These data show that small enterprises in Russia have not yet taken a worthy place in the economy, although they have the necessary potential (Tahavieva & Nigmatullina, 2017).

The issues related to the participation of small business in the procurement operations carried out by public institutions in different countries are given a lot of attention in various researches. The most interesting among such studies are as follows.

The research (Handler, 2015) is devoted to the study of public procurement framework development in the EU. It is noted that apart from solving economic problems, in the course of such purchases one also pursues social, environmental and innovative goals. The article (Preuss, 2011) analyzes the participation of small enterprises in public procurement in the UK. The author makes a conclusion that in industrialized countries the public procurement accounts for a significant part of GDP. Therefore, for the development of small businesses in the regions it is extremely important to use this potential. The

article (Thomassen, 2016) studies the access of small enterprises to public procurement markets in the European Union, as the main element of an economy. Attention is drawn to two patterns: the average cost of contracts was going down and, furthermore, between the countries there was a significant difference in this regard.

The study (Is open competition, 2017) points out that subsidies, quotas and other special conditions for public procurement are set for small enterprises based on the assumption that such enterprises are a relatively weaker category of participants in public procurement contracts. The same issue is addressed in another paper (Technical Report: Policies that Promote SME ..., 2017). It deals with the preferential public procurement policies for small and medium-sized enterprises. The article justifies the need for such preferences due to information, financial, regulatory and personnel barriers that arise in many countries in the procurement process, starting from the preparation phase and finishing with decision-making and conflict resolution. The existence of barriers to the participation of small enterprises in public procurement in Nigeria is also discussed in the article (Akenroye and Aju, 2013). It proves that the main obstacles are the lack of clarity of information, the inability to prepare bidding documentation and the lack of knowledge about the necessary procedures.

The article (Kidalov and Snider, 2011) draws attention to the social aspects associated with the participation by small enterprises in the procurement operations of public institutions in the United States and Europe, as well as to the importance of political support for ensuring the presence of such enterprises in public sector markets. The monograph (Bovis, 2007) shows that the success of small businesses in the bidding process increases with the division of a tender into smaller lots (i.e. increasing the number of lots), and, conversely, decreases with an increase in the size of lots. The article (Ortuzar et al., 2017) examines the experience of the largest electronic market in Chile, which, according to the authors, provides a transparent, universal, accessible and effective system of public procurement for companies of all sizes, especially for micro and small enterprises.

The Russian studies focused on legal and organizational aspects of public procurement (Galanov and colleagues, 2010; Kichik, 2012; Mitkovskaya, 2014; Trefilova, 2010, Gaisina and colleagues, 2017). A number of articles

discussed some aspects of the participation by small businesses in contracts for government procurement (Baltutite, 2014; Galkin, 2014; Kostyuchenko, 2015; Obalyaeva and Cherniy, 2015; Bakhtizin and colleagues., 2016). Thus, in Russia, likewise in other countries, small businesses play a significant role in public procurement. However, it is safe to say that there is a lack of empirical scientific works associated with the assessment of a role played by Russian small business in the implementation of such contracts. This makes our studies relevant, and their findings are dealt with herein.

### Methods of Research

This article focuses on an analysis conducted with regard to the current level of participation by small enterprises in regional public procurement contracts. This analysis is essential, since it allows to justify the ways of further development of the procurement activities carried out by small enterprises and to monitor such operations, as well as to decide what changes are to be made in the contract system formation strategy and in the organization of its functioning. The aim of this study was to assess the level of participation by small enterprises in contracts for public regional procurement. At the same time, the following tasks were solved: a methodical approach was justified, the impact of legislation on the volume of participation by small enterprises in public procurement was analyzed, as well as economic and mathematical models were developed. These models describe how many contracts are there per 100 small enterprises, how much the number and value of contracts with small enterprises account for in the total number and total value of contracts concluded with all suppliers, how much the value of public contracts account for in the total turnover of small regional enterprises, what is the average value of government contracts per small enterprise and the average price of a contract. Such models were analyzed and patterns characterizing the current values of relevant indicators were defined.

Certainly, the needs for public procurement are objective and reflect the situation in a particular Russian region and its needs for certain goods, products and services. However, the contracts to be concluded are subject both to legally established procedures and participation by enterprises in the preparation of bidding documentation, as well as the prices charged for the supply of goods, products and services

specified in such documentation. As a rule, the placement of state orders is carried out through bidding in the form of tenders and auctions (including in electronic form), as well as by requesting quotations and proposals.

Small enterprises are known to be independent economic entities that carry out risky activities and decide on their own as to whether they need to participate in the performance of certain works, including those related to public procurement. In these cases, after receiving information about such purchases, the head of a bidding enterprise is to establish:

- whether the structure of participation in procurement is of any interest to him or her;
- how he or she is satisfied with the starting (maximum) price of a contract;
- whether it makes sense to participate in the procurement, based on the submitted terms of reference and other documentation;

- what price is to be quoted in the bidding documentation if he or she decides to participate in the procurement process.

The price reduction leads to a decrease in the expected profit, i.e. a decrease in the interest of small enterprises in the conclusion of a relevant contract.

The decision on whether a particular enterprise should participate in public procurement is made taking into account the following criteria:

- availability of specialists and technologies to ensure timely and quality provision of works (goods, services);
- expected profit;
- additional financial resources required;
- experience with similar contracts;
- intensity of other works;
- expected schedule of the contract if concluded.

However, one desire for concluding contracts is not enough, because in the process of public procurement an important role is played by the selection of those bidders who have offered the most favorable conditions for public authorities. It is obvious that at the tender stage only a part of small enterprises that have submitted bids are subsequently awarded with contracts. It should be taken into account that small enterprises compete with each other and with enterprises of other forms of incorporation.

The organization of bidding in the form of tenders and auctions and the selection of their winners prevent these processes from being a foregone conclusion. The purpose of public procurement based on the methodology

adopted in Russia is to rule out the possibility of appointing suppliers in advance, i.e. not to allow the winners to be known before the end of the auction. As mentioned above, the purpose of public procurement is to promote competition, ensure cost saving and avoid corruption. Thus, the list of suppliers may be made only after the tender winners have been determined and the contracts for executing state orders have been concluded. These arguments suggest that the processes of bidding for state orders are probabilistic and their specifications are set under the influence of various random factors. Economic and mathematical modeling was used to describe the current differentiation in the level of participation by small enterprises in the implementation of contracts. The probability density functions of a normal distribution were used as models. As shown by earlier studies, these functions are good at describing the relative performance of small business populations in Russian regions (Pinkovetskaya, 2013; Pinkovetskaya, 2015).

The probability density  $y(x)$  is a derivative of the non-decreasing function  $F(x)$ , therefore it is non-negative throughout the change interval, i.e.  $y(x) \geq 0$ . The distribution density function contains complete information about a random variable. The main numerical characteristics that describe a particular random variable are:

- attributes of the position of a random variable on the numerical axis (mode, median, mathematical expectation). It should be noted that for the normal distribution density functions these three attributes are equal. For a random variable that is described by the density distribution  $y(x)$  a mathematical expectation is used;
- attributes of the spread of a random variable near the mean is called a standard deviation  $\sigma(x)$ ;
- skewness and excess kurtosis ratios, which are zero for a normal distribution.

Overall, the modified density function of a normal distribution looks as follows:

$$y(x) = \frac{K}{\sigma \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x-m)^2}{2 \cdot \sigma^2}}$$

where  $m$  - mathematical expectation;

$\sigma$  - standard deviation;

$K$  - ratio defined by the attributes of described random variables and by their dimensions.

The normal distribution density function graph (1) is a symmetric unimodal bell-shaped curve, the symmetry axis of which is a vertical drawn through point  $m$ , which is the center of the normal distribution density function symmetry. It is known that for a normal distribution density function the frequency of values ranging from  $m - \sigma$  to  $m + \sigma$  is 68.3%, for those ranging from  $m - 2\sigma$  to  $m + 2\sigma$  is 95.4% and for those ranging from  $m - 3\sigma$  to  $m + 3\sigma$  is respectively 99.7%.

The main advantage of normal distribution density functions is that with their help it is possible to obtain unbiased estimates which characterize both average values of the performance of small enterprises and the intervals of change of indicators typical for small enterprises. The comparability of indicators for different regions of Russia was ensured by the fact that the studies were based on such relative indicators as the number of contracts per 100 small enterprises, the proportion of the number and value of contracts with small enterprises in the total number and total value of contracts concluded with all suppliers, the proportion of the value of public contracts in the total turnover of small enterprises in the regions, the average value of public contracts per small enterprise, as well as the average value of one contract concluded between small enterprises and regional public authorities.

The analysis of patterns characterizing the current level of participation by small enterprises in public procurement contracts included the following stages:

- creation of a data base which describes for each region of Russia the indicators characterizing the public procurement contracts signed by small enterprises;
- creation of a data base which describes for each region the indicators characterizing the number of small enterprises and their output;

- analysis of the dynamics of the number of contracts concluded with small enterprises and their value for the period from 2010 to 2014;
- calculation of the number and value of public procurement contracts concluded with small enterprises per small enterprise in each of the regions;
- calculation of how much the number and value of contracts concluded with small enterprises account for in the total number and value of all contracts for each of the regions of Russia;
- calculation of the average value of one contract concluded with a small enterprise;
- calculation of the value of public procurement contracts per small enterprise;
- calculation of how much the public procurement contracts account for in the turnover of small enterprises by region;
- formation of the normal distribution density functions for all the indicators in question;
- evaluation of the quality of such functions through testing;
- analysis of the resulting models which characterize the participation of small enterprises in state contracts.

The normal distribution density functions were considered as functions describing the distribution of all the above specific indicators. During a computational experiment, the hypothesis of whether it was possible to describe

distribution patterns of the above specific indicators using such functions was tested.

When carrying out the research, the arrays of official statistical data presented in the document published by Federal State Statistics Agency (Small and medium-sized enterprises in Russia, 2015) were used as the input data. In particular, we used indicators that characterize the number of small regional enterprises and their output, as well as public procurement contracts concluded with small enterprises in all regions.

The computational experiment was conducted using the methods of statistical analysis and economic-mathematical modeling. The resulting functions were verified using Pearson tests (Kremer and Putko, 2002), Kolmogorov–Smirnov, Shapiro–Vilka (Bolshev and Smirnov, 1983).

### Results and Discusses

**- Participation of small enterprises in the contract system:** The study included an analysis of the dynamics in the number and value of contracts concluded between regional public authorities and small enterprises. Table I shows the total number and value of such government contracts concluded under the procedures established by law for small enterprises for the period from 2010 to 2014.

Table I. Number and value of contracts with small enterprises under small enterprise procedures Year

Indicator	Year				
	2010	2011	2012	2013	2014
The number of contracts with small enterprises, units	88711	81556	108496	136221	209395
The value of contracts with small enterprises, mRUB	60553	70733	76024	82931	149847

The data presented in Table I show a sharp increase in the number of contracts and their value in 2014 compared to previous years. Thus, in comparison with 2013, the number of contracts concluded increased by 54%, and their value by 81% (with an inflation of 11.36%). In our opinion, this growth is largely due to the introduction in 2014 of a new institutional

framework for the public procurement in Russian regions in connection with the entry into force of statutory regulations established by the above law No. 44-FZ. Unlike the previous law No. 94-FZ, the new law resolved a number of issues related to the legislative and organizational support for the participation by small enterprises in public procurement.

The new law also stipulates that purchases from small businesses should account for at least 15% of the total procurement. Small enterprises are allowed to participate in tenders and auctions related to the defense and security of the state, as well as to the implementation of works in the field of nuclear energy.

Open tenders, restricted tenders, two-stage tenders, electronic auctions, requests for quotations, requests for value propositions may be limited to small businesses only. In this case, bidders are required to prove that they are small businesses. When choosing a supplier, in the notice of procurement the customer may set a requirement for the supplier which is not a small enterprise, as well as engage subcontractors and co-contractors from among small enterprises. Moreover, the participation of small enterprises is stipulated in the contract as a percentage of the total contract price.

The starting price of a contract is set at 20 mRUB, thereby creating prerequisites so that the share of relevant works to be performed by small businesses participating in public procurement is quite significant. However, to ensure the participation of small businesses, larger contracts should be divided into several lots. It should be

**- Assessment of the participation of small enterprises in the contract system:** The following stages of this study involved the development of normal distribution density functions describing the performance of small enterprise populations in Russian regions in

noted that the starting price of 20 mRUB is almost two and a half times higher than the current average annual output of goods and services of a small enterprise. Therefore, given that in Russia most enterprises (and especially sole traders) have up to 3 employees (Pinkovetskaya, 2016), it seems appropriate to recognize micro-enterprises and small enterprises as standalone bidders and, hence, to allocate separate quotas for them. Incidentally, a similar proposal is validated in the article (Flynn et al., 2015), assuming that for small enterprises with limited resources it is difficult to compete with larger small enterprises.

An important role for ensuring the participation of small enterprises in the federal contract system is to inform them in advance about the upcoming public procurement. Procurement planning is expected to be carried out in two stages. At the first stage, purchases are planned for three years. At the second stage, an appropriate plan is drawn up for each coming year. Such an approach can encourage small enterprises to upgrade their production facilities with modern technical means and innovative technologies.

terms of public procurement participation. When developing these functions, we used the arrays of information for each Russian region. Table 2 shows a fragment of the input data (for 6 regions) describing the public procurement contracts concluded with small enterprises, as well as supporting information (the number and turnover of small enterprises)

Table 2. A fragment of the input data (for 2014)

Russian region	Contracts with small enterprises, units	Value of contracts with small enterprises, mRUB	Percentage of contracts with small enterprises in the total number of contracts with suppliers, %	Percentage of contracts with small enterprises in the total value of contracts with suppliers, %	Total number of small enterprises, units	Total turnover of small enterprises, bRUB
Belgorod region	1172	473,5	18,6	3,7	62963	381,6
Bryansk region	980	392,9	24,3	6,4	32125	306,9
Vladimir region	3671	1429,3	28,5	21,5	47471	264,3

Voronezh region	6604	1984,0	20,4	12,9	68731	602,4
Ivanovo region	1141	272,1	19,1	3,4	36959	295,8
Kaluga region	2227	1019,8	21,7	10,3	29644	254,3
...	...	...	...	...	...	...

The normal distribution density functions developed during a computational experiment are presented below.

The first function describes how much 100 small enterprises account for in the total number of public procurement contracts concluded in all regions of Russia with small enterprises per ( $x_1$ , units),

$$y_1(x_1) = \frac{140,0}{2,6 \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x_1-5,0)^2}{2 \cdot 6,8}} \quad (2)$$

The second function shows how much the contracts concluded with small enterprises account for in the total number of contracts awarded through tenders (lots) and requests for quotations ( $x_2$ , %)

$$y_2(x_2) = \frac{360,0}{5,5 \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x_2-21,8)^2}{2 \cdot 30,3}} \quad (3)$$

The third function describes dynamics in the average value of a public procurement contract concluded under the rules set for small enterprises in regions ( $x_3$ , mRUB)

$$y_3(x_3) = \frac{17,1}{0,2 \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x_3-0,6)^2}{2 \cdot 0,04}} \quad (4)$$

The fourth function reflects a distribution of the value of regional public procurement contracts concluded with small enterprises, per small enterprise ( $x_4$ , kRUB)

$$y_4(x_4) = \frac{1133,3}{15,7 \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x_4-29,3)^2}{2 \cdot 246,5}} \quad (5)$$

The fifth function shows how much the public procurement contracts account for in the total turnover of small enterprises in the regions ( $x_5$ , %)

$$y_5(x_5) = \frac{14,0}{0,2 \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x_5-0,4)^2}{2 \cdot 0,04}} \quad (6)$$

The sixth function shows how much the value of contracts concluded with small businesses accounts for in the total value of contracts concluded with all suppliers ( $x_6$ , %)

$$y_6(x_6) = \frac{240,0}{4,3 \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x_6-9,8)^2}{2 \cdot 18,5}} \quad (7)$$

Subsequently, a quality analysis was carried out for the developed functions. Table 3 shows calculated values of the main statistics on three tests. A comparison conducted in respect of the calculated values suggests that the statistics on Pearson test are less than the table value of 9.49. Similarly, the calculated values for Kolmogorov-Smirnov test are lower than the table value of 0.152 with the significance level of 0.05. The statistics on Shapiro-Vilka test exceed its table value of 0.93 with a high level of significance of 0.01. Thus, for all these tests the developed models are of high quality and can be used to describe the patterns under review.

Table 3. The calculated values of statistics on quality tests

Function number	Calculated value as per quality test		
	Kolmogorov-Smirnov test	Pearson test	Shapiro-Vilka test
(2)	0,05	2,23	0,96



(3)	0,04	1,17	0,97
(4)	0,09	3,64	0,95
(5)	0,06	2,11	0,95
(6)	0,05	1,79	0,96
(7)	0,05	1,71	0,97

Since all the developed functions are good at approximating the input data and are of high quality according to the accepted standards. Therefore, it may be concluded that it makes sense to use the normal distribution density functions in order to describe the patterns and analyze all the indicators considered herein.

**- Discussion of achieved results:** The developed functions (2) - (7) enable to estimate Russian regions' average values of the considered indicators and their change intervals typical for most regions of Russia.

A feature of the normal distribution density functions (Wentzel, 2001) is that they can be

used to determine the average values and change intervals of the indicators in question without having to perform complex calculations. As mentioned above, for most regions (68.3%) these intervals are calculated based on the standard deviation values of relevant indicators. In this case, in order to calculate the interval boundaries with regard to the average value of an indicator, one should add and subtract the specified deviation to and from the average value of an indicator, respectively.

The average values and intervals of all the above indicators are presented in Table 4. They are based on the developed models (2)-(7).

Table 4. Public procurement contracts concluded with small enterprises in Russian regions in 2014

Indicator	Average value	Change intervals
Number of contracts per 100 small enterprises, units	5,0	2,4-7,6
Percentage of contracts with small enterprises in the total number of contracts, %	21,8	16,3-27,3
Average price of one contract with small enterprises, mRUB.	0,6	0,4-0,8
Contract price per small enterprise, kRUB.	29,3	13,6-45,0
Percentage of public procurement contracts in the total turnover of small enterprises, %	0,4	0,2-0,6
Percentage of the value of contracts with small enterprises in the total value of contracts, %	9,8	5,5-14,1

Table 4 shows that about 5% of all small enterprises participate in the regional public procurement system. However, in most regions it varies from 2.4% to 7.6%. As mentioned in the introduction, small businesses account for 17% of Russia's GDP. Yet, in the total number of contracts the percentage of contracts with small enterprises is slightly higher. One of five is concluded with small businesses. This indicator's change interval is from 16% to 27%. Given this, it can be concluded that the contract system in

Russia affects the interests of a small proportion of small businesses.

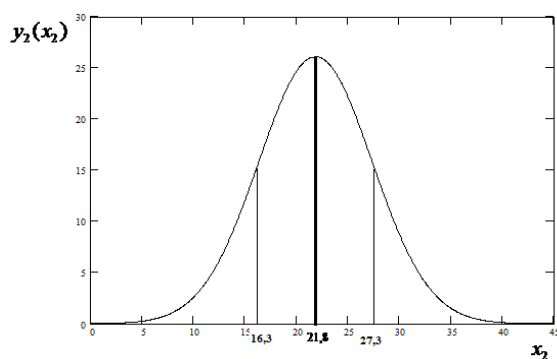
It should be noted that a similar situation is typical for some countries of the European Union. For instance, according to the document (Evaluation of SMEs'..., 2014), a statistical analysis of the concluded contracts suggests that in a number of the countries small enterprises lack representation in public procurement. However, in some European countries, there is a high

percentage of such enterprises in procurement. According to the document (Thomassen and colleagues, 2016), the percentage of small businesses in the number of contracts awarded ranged from 84% in Greece to 44% in Spain. In relation to the total value of public procurement, the range was even wider: from 78% in Greece to 19% in Portugal.

Both the average price of contracts with small enterprises and their number have a significant differentiation by Russian regions. This situation is typical not only for Russia but also for other countries. As a case in point we may mention Italy (as described in the article Albano, 2015), where the tendency of firms to participate in public procurement to some extent depends on their geographical location.

Figure 1 shows the normal distribution density function corresponding to formula (3) as an example.

Figure 1. Density function of nominal distribution



of the percentage of contracts with small enterprises in the total number of contracts, %.

Figure 1 shows the values of parameters, including the average value which contracts with small businesses account for in the total number of contracts (21.8), as well as the value of an interval applicable for most regions (68.3%). The value of such interval is calculated based on the standard deviation (boundaries of the interval correspond to the values  $21,8 \pm 5,5$  ).

The average price of one contract concluded in 2014 under the rules set for small enterprises is 600 kRUB. It should be noted that the output (goods/works/services) per employee of small enterprises in the same year amounted to an average of 2.3 mRUB, i.e. each employee produced almost four times more products than the average contract value. This phenomenon

may be due to the fact that for most small enterprises performing state contracts this activity was sporadic, i.e. it was carried out for a limited period of time, and the state was not their main (large) customer.

It should also be noted that in most regions of Russia the public procurement contracts account for as little as 0.6% in the total turnover of small enterprises. Moreover, the annual regional public procurement spendings per small enterprise are very small and range from 13 to 45 kRUB.

In the total value of contracts the contracts with small enterprises account for a significantly (almost 2 times) less percentage than that of the number of contracts. This suggests that there is a large difference in the value of contracts with small businesses and contracts with other businesses and organizations. It should be noted that in the total annual volume of purchases in half of the regions the contracts with small enterprises account for 1.5 times less than the minimum value established by the legislation effective in 2014 (15%). Furthermore, in less than 16% of the regions, the participation of small enterprises in public procurement meets the statutory regulation.

## Conclusion

Overall, the studies have led to the following conclusions:

- there has been a significant increase in the number of regional public procurement contracts with small enterprises, as well as in the value of such contracts;
- organizational and legal aspects of the federal law, which came into force in 2014 and regulates the contracting framework, have ensured that more and more small enterprises have access to public procurement;
- in order to describe the current level of participation of small enterprises in regional public procurement, one may use the normal distribution density functions as economic and mathematical models;
- we have analyzed the distribution of specific indicators describing the number of contracts per 100 small businesses, how much the number and value of contracts with them account for in the total number and total value of contracts respectively, how much the value of contracts accounts for in the total turnover of small businesses in the regions, as well as what is the

average value of public contracts per small enterprise and the average value of a contract;

- all the developed distribution density functions are good at approximating the input data and are of high quality according to the accepted standards;

- we have calculated average values of the indicators in question for all the regions, as well as their change intervals, which are typical for most regions of Russia;

- we have analyzed the calculated indicators describing the contracts concluded with small enterprises for the supply of goods, works and services;

- we have prepared proposals and recommendations for ensuring greater participation of small enterprises in regional public procurement contracts.

The findings of this study are of a certain theoretical and applied significance, in particular, for justifying proposals for the development of state support for small enterprises. The developed models and the resulting patterns can be used in resolving a wide range of issues related to the monitoring of participation by small enterprises in public procurement contracts, as well as designing its development and forecasting this area of public administration.

Overall, the public procurement framework which has been formed in Russia in recent years continues to adjust to the peculiarities of small business operations.

Further development of such contract system should include the following provisions:

- increasing transparency of the results of public procurement tenders;

- reducing the procurement participation costs for small businesses through the development of new information exchange technologies;

- ensuring absolute compliance with mandatory quotas for purchases from small enterprises;

- regular monitoring of the level of participation by small enterprises in public procurement in each of the regions;

- providing small businesses with the necessary technological and organizational tools, as well as methodological developments to facilitate participation in public procurement;

- creating registers of reliable small businesses that have a positive history of contract execution;

- ensuring that the contracts include advance payments, without which the production or provision of services by small businesses is difficult;

- making it possible that several small businesses may compete for one lot at the same time;

- simplifying bidding documentation submission, as small enterprises usually do not have highly qualified specialists in the field of public procurement.

As shown in the documents of the European Union (Evaluation of SMEs', 2014; European Commission, EU Public Procurement Reform, 2016), these measures should help to improve the efficiency of public procurement.

Further development of the contract system, which is aimed at attracting small businesses to bid for the purchase of goods, works and services for state regional needs, will improve the efficiency of bidding for state orders, the level of competition in tenders and auctions, as well as in terms of cost saving.

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