

Modern Development of Small and Medium-Sized Cities: Trends and Drivers



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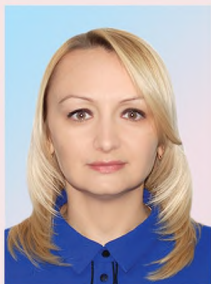
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Abstract. The processes of urbanization occurring in the world and in Russia, in addition to large cities and megacities, also affect small and medium-sized cities. However, while for the former there is a great deal of research on both the inner-city environment and socio-economic development in general, for the latter there is a lack of such studies. The main idea of the article is that an effective policy for the development of a city requires a comprehensive analysis of its place and role in the regional system and an understanding of the factors that ensure economic growth and create attractive conditions for the population. The purpose of the paper is to identify trends in and drivers of socio-economic development of small and medium-sized cities. The study identified problems and “bottlenecks” in the analysis of urban development. They include the weakness of methodological approaches to the assessment of current trends and factors in the development of small and medium-sized cities, taking into account their specifics, as well as the lack of necessary statistical information for a full-fledged analysis. The scientific

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novelty of the study lies in the fact that we propose our own methodology for determining the trends and factors in development of small and medium-sized cities, which differs from traditional approaches by including the analysis of the distribution of cities in the regional system (according to Zipf's law) in the dynamics and constructing a system of econometric models of the influence of factors on social and economic development. Testing the proposed approach in the Belgorod Oblast revealed a trend of divergence of small and medium-sized cities, increasing imbalances in population distribution, and the growth of small urban and rural settlements near Belgorod. The scientific hypothesis of the study is that the socio-economic situation in small and medium-sized cities is primarily positively influenced by investment in fixed capital and only then by such factors as an increase in housing stock, educational development, the work of sports and cultural institutions. The factors contributing to the social and economic development of cities are investments in fixed capital, the total number of residents, especially schoolchildren, the housing supply, and the development of sports and cultural institutions. The research findings are of practical value for the design and implementation of development policies for small and medium-sized cities in Russia.

Key words: economic geography, urbanization, small and medium-sized cities, impact factors, urban planning, urban growth, creative class, Zipf's law, Belgorod Oblast of Russia, regional development.

Acknowledgement

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Introduction

For more than 100 years, industrialization has stimulated the concentration of population in large cities. Today more than half of the world's population lives in cities (55.715%)¹. It is not for nothing that Russia is known as a highly urbanized country, with an urban proportion of 74,74%². Researchers face many questions – from the formation of a livable inner-city environment to determining the general trends and drivers of urban development in modern conditions.

Many areas can be distinguished in the research field of urban development. One of the most relevant among them includes the identification and assessment of the factors contributing to socio-economic development of the city in order to form recommendations to improve the welfare and quality of life of the population.

Nationwide and global factors have a greater positive effect in those cities that have developed useful institutional prerequisites and governance practice, established communications and created conditions that attract new resources and trigger cycles of cause and effect aimed at development.

For a long time, only two main criteria were considered as drivers of urban growth: distance to the city center and transportation costs (e.g., Alonso, 1960; Ullman, 1941). Later it became clear that this approach was too narrow even for model building. The number of factors has grown considerably, and works have appeared that single out one group of causes of economic growth. For example, in the aggregate human (labor) potential of a city it is now customary to single out the creative component (for more details see. Florida, 2003; Batabyal, Nijkamp, 2018; Rastvortseva, Korbankova, 2021). Many studies are devoted to the emergence and development of agglomeration processes in cities (e.g., Harrison et al., 1996).

¹ According to World Bank for 2019 (data.worldbank.org).

² Calculated according to the Federal State Statistics Service as of January 1, 2021 (rosstat.gov.ru).

Questions concerning urban development factors have been raised among urban studies researchers (e.g., Jargowsky, 1997; Massey, Nancy, 1993; Wilson, 1997) and regional studies (e.g., Dreier et al., 2004; Katz, 2000; Pastor et al., 2010). Works that discuss the causes and consequences of concentrated poverty, looking at crime rates, schooling rates, and poor access to labor markets are especially noteworthy. For example, declining schooling in particular cities increases the proportion of students from poor families, middle-class demand for housing declines, wealthy families tend to leave the region, and the subsequent increase in crime further exacerbates the situation (Orfield, 2002). Schooling is an important factor in urban development, but it also becomes a cause of growing spatial inequality.

Thus, we see that research on development drivers is in demand from both scientific and practical points of view. The relevance of our study is also substantiated by the lack of research on the development of small and medium-sized cities (Marais, 2016). Russian publications include, for example, a study of cities in Perm Krai (Meshkov et al., 2013), focusing on the analysis of socio-economic development. It considered such factors as administrative (transfer of settlements to urban or rural settlements, their association with larger cities), natural population movement, migration processes, changes in the sex-age structure, etc. The analysis of the economy was conducted at the level of the region (not cities), which is explained by the incompleteness of municipal statistics.

In the work on the cities of the Bryansk Oblast³, much attention is given to assessing resource potential, identifying development priorities, and formulating recommendations. There are known works based on small and medium-sized cities in

the Perm Oblast, the Komi-Permyak Autonomous Okrug⁴, the Kurgan Oblast (Buldakova, 2011), the Vladimir and Tula oblasts and Perm Krai (Oborin et al., 2017), and the Sverdlovsk Oblast (Makarova, 2017). One of the most comprehensive studies can be called (Uskova, Sekushina, 2021), which analyzes small and medium-sized cities of the European North of Russia as a whole and, in more detail, the Vologda Oblast. A number of works identify strategic priorities for urban development and formulate practical recommendations (e.g., Zhikharevich et al., 2017; Popov, Gnatyuk, 2017). At the same time, in our view, the issues of quantitative assessment of development factors often remain undisclosed, and are determined at the regional level or without the use of mathematical tools.

The purpose of the study is to identify trends and drivers of modern socio-economic development of small and medium-sized cities. The scientific novelty of the work consists in the methodological approach to the assessment of development trends through (1) the analysis of cities distribution by the number of population (according to Zipf's law) in dynamics, identification of development trends as well as geographical growth territories, (2) construction of models of factors' influence on economic and (3) social development, (4) interpretation of obtained results. The recommendations of the study will be valuable for local economic policy.

Theoretical and empirical studies of the socio-economic development of small and medium-sized cities

Small and medium-sized cities are the link between large urban agglomerations and rural settlements. However, regional economics and economic geography concentrate more on the

³ Grachev A.B. (2005). Socio-economic development of small and medium-sized cities (Case study of the Bryansk Oblast): Candidate of Sciences (Economics) dissertation. Moscow.

⁴ Medvedeva I.A. (2004). Tendencies and strategies of socio-economic development of small and medium-sized cities of the region (case study of Perm Krai and Komi-Permyak Autonomous Okrug): Candidate of Sciences (Economics) dissertation. Yekaterinburg.

analysis that focuses on large cities⁵. Scientific papers raise issues of urban zoning and social groups (Burgess, 2002), the distribution of functional areas depending on transportation routes and priority economic activities, the formation of a favorable urban environment, ecosystem, satisfaction with urban public space and its impact on the growth of citizens' well-being (Weijs-Perrée et al., 2019), etc. While the development of small and medium-sized cities, for which other issues need to be mainstreamed, is the subject of far fewer and generally insufficient studies (Bell, Jayne, 2009).

Small and medium-sized cities around the world are the fastest-growing settlements. Their population living in them is expected to grow by 32%, or 469 million people, between 2015 and 2030 (for comparison, large metropolitan areas are expected to grow by 26%, or 203 million people, over the same period) (Birkmann et al., 2016). The rate of urban population growth matters more than city size when it comes to how susceptible people are to adverse events (Garschagen, Romero-Lankao, 2015). Indeed, rapid development overloads local administrative capacities, which is reflected in the greater vulnerability of small and medium-sized cities to economic, social, environmental, epidemiological and other shocks.

Small and medium-sized cities have their own specific features. They are different in a number of ways: economic specialization (Hamdouch et al, 2017); closeness to or remoteness from large agglomerations, transport routes and hubs, national land and sea borders; ethnicity make up of the population – its traditions, customs, attitude to labor, power; historical preconditions for development – established science cities, industrial, commercial, cultural, tourist, agricultural, etc.; by the degree of involvement in interregional and

international relations – with export-oriented or import substituting economy; development stage – growing or depressed.

We believe that all small and medium-sized cities can be united by the fact that the key resources for their development are the population (human capital), investment and revenues of the local budget (physical capital) and the management resource.

In world practice, small and medium-sized cities are usually distinguished by population size. German and Dutch researchers consider settlements with the population of 5–20 thousand people to be small cities, while medium-sized cities have a population of 20–100 thousand people (Gatzweiler et al. (Gatzweiler et al., 2012; Van Leeuwen and Rietveld, 2011). In the USA small cities are considered to be settlements with a population of 25–50 thousand people, medium-sized cities – with a population of 50–100 thousand people, and large cities – with a population over 100 thousand people (Feeney et al., 2020, p. 825). In China, small and medium-sized cities include settlements with up to 500 thousand inhabitants (Qi et al., 2013). The study on Africa, Asia, and Latin America (Birkmann et al., 2016) refers to settlements with 300–500,000 inhabitants as small cities, and cities with up to 5 million inhabitants as medium-sized cities.

In Russia, medium-sized cities include settlements with a population of 50–100 thousand people, small cities are up to 50 thousand people with three subcategories: up to 10 thousand, 10–20 thousand, over 20 thousand people. Small cities include urban-type settlements⁶. Both in Russia and in many other countries there is a practice of defining the status of cities and rural settlements with regard to functional and administrative aspects.

⁵ According to the classification in the Russian Federation, large cities include cities with a population of between 250,000 and 1 million people.

⁶ Code of Rules SP 42.13330.2016 “SNIp 2.07.01-89* Urban development. Urban and rural planning and development”, approved by Order of the Ministry of Construction and Housing and Communal Services of the Russian Federation dated December 30, 2016, no. 1034/pr, entered into force on July 1, 2017.

Figure 1. Distribution of cities by population in the federal districts of Russia, as of January 1, 2021, units



By columns: 1 – up to 10,000 people, 2 – 10,000–14,999 people, 3 – 15,000–19,999 people, 4 – 20,000–29,999 people, 5 – 30,000–49,999 people, 6 – 50,000–99,999 people, 7 – 100,000–149,999 people, 8 – 150,000–199,999 people, 9 – 200,000–249,999 people, 10 – 250,000–499,999 people, 11 – 500,000–999,999 people, 12 – 1,000,000 people and more.

Source: compiled according to Population of the Russian Federation by municipalities on January 1, 2021. *Rosstat*, Moscow, 2021.

There were 1,115 cities in Russia in 2021⁷. Based on population size, we categorize them as follows:

1) cities with population exceeding one million – 15 cities with a population of 1,004,763 (Volgograd) to 12,655,050 (Moscow) people;

2) largest – 24 cities with a population ranging from 507,216 (Lipetsk) to 948,827 (Krasnodar) people;

3) large – 39 cities with a population ranging from 257,757 (Khimki, Moscow Oblast) to 495,810 (Cheboksary) people;

4) big – 93 cities with a population ranging from 10,009 (Zelenodolsk of the Republic of Tatarstan) to 248,269 (Taganrog) people;

5) medium-sized – 151 cities with a population of 50,079 (Kirishi, Leningrad Oblast) to 99,469 (Novokuibyshevsk, Samara Oblast) people;

6) small – 793 cities with populations ranging from 866 (Innopolis) to 4,933 (Cheremkhovo, Irkutsk Oblast) people.

We can see that the number of medium-sized and small cities far exceeds the number of cities in the other categories. They account for 84.66% of the total number of cities. In addition, urbanization also affects urban-type settlements, the number of which, according to Rosstat, on January 1, 2021 amounted to 1,181 settlements.

Rosstat divides cities according to population size into 12 groups (*Fig. 1*).

According to the Rosstat grouping, small and medium-sized cities include the first six groups. Their share in the total number ranges from 43% in the Southern Federal District to 83% in the Urals Federal District. The proportion of small cities varies from 20% in the North Caucasian Federal District to 74.24% in the Far Eastern Federal District.

The success of cities is largely explained by the ways of forming links with other entities in the

urban system of the region. It is the relationship of small and medium-sized cities with their regional context and the performance of functions within a mono- or polycentric system of cities in the region that are key factors contributing to economic development (Meili, Mayer, 2017). The development of regional centers, small and medium-sized cities can be positively influenced by national and international relations carried out through leading companies, international institutions, cultural and scientific events (Meijers et al., 2016; Camagni et al., 2015).

Despite the features of the emergence and development of each settlement, small and medium-sized cities have a common set of problems:

1) natural population decline and migration to larger cities;

2) migration outflow of young and active residents;

3) underfunding of infrastructure;

4) dependence on industrial enterprises, dominance of a single industry in the city economy;

5) environmental problems caused by the development of extractive and manufacturing industries or agriculture in or near the city;

6) low income of a large part of the population;

7) lack of housing and/or unsatisfactory quality of housing stock;

8) insufficient level of health care services, education, cultural and sports institutions, etc.

Review of drivers of socio-economic development of small and medium-sized cities and research hypotheses

We can distinguish two groups of urban development drivers: geographical and non-geographical. The first include the location in relation to major cities, roads and other transport interchanges, access to the sea, natural and climatic conditions, and others. Agglomeration effects are also considered here: the physical closeness of

⁷ Cities of Russia. Available at: <https://xn---7sbiew6aadnema7p.xn--plai/> (accessed: December 1, 2021).

companies to each other and/or a city to other settlements increases overall efficiency by sharing infrastructure, economic intermediaries, a common labor market, and facilitated knowledge and technology transfer (Rastvortseva, Amanalieva, 2021).

Rapid urban growth leads to the emergence of negative agglomeration effects – an increase in factor prices and a decrease in the marginal returns from them, an increase in the burden on the transportation system and the environment, etc. (Henderson, Becker, 2000; Richardson, 1987).

In small and medium-sized cities, agglomeration effects stimulate economic growth, but they are difficult to obtain (Au, Henderson, 2006). Some papers consider the positive effects (diffusion of effects) of large cities on medium-sized and small cities that fall within their agglomerations (e.g., Jianyong Fan, 2006), but in general quantitative empirical studies in this area are insufficient.

Non-geographic factors can be divided into economic and technological factors. These include physical capital, human resources, and technological progress. **An increase in physical capital**, including through investment, contributes to the growth of labor productivity, overall efficiency, leads to an increase in income and improves the quality of life of the city's inhabitants. Cities that offer a high quality of life are attractive to highly educated and creative people with entrepreneurial abilities. Since the problem of housing is urgent, in our opinion, an increase in the housing stock will contribute to the development of the city.

The quality of human capital, which includes knowledge and skills acquired through education and experience, is an important condition for economic growth. Quality human capital is people with a high level of education, capable of creating new knowledge and ideas in different sectors of the economy. Speaking about the quality of human capital, we should note that the creative class of the city's population is of great importance today.

The main conditions that attract members of the creative class are local culture (including an environment of openness and tolerance); local opportunities (they can be assessed, for example, through the proportion of the labor force in health care, public education, cultural and leisure activities); economic situation (employment and wage levels, land prices) (Rikalović et al., 2020, p. 186).

Human capital is significantly influenced by the quality and accessibility of social infrastructure and the comfort of living. These factors provide the formation and accumulation of human capital. Favorable conditions and quality of life in the city are characterized by a high level of development of health care, culture and sports. Urban residents consider the lack of such institutions to be a serious problem, and the development of mass physical culture becomes a benchmark for local governments when conducting social policy (Sekushina, Kozhevnikov, 2018). These areas can be reflected in statistics as social infrastructure facilities (e.g., the number of sports facilities) and by counting the number of employees of relevant organizations.

An important factor contributing to favorable living conditions in a city is the environmental situation. Statistical data on the level of pollution, environmental protection and other indicators are not provided broken down by small and medium-sized cities of Russia. We believe that the analysis of the environmental component should be carried out not only for each settlement separately, but also in their interconnection. Such a study based on data analysis should be supported by monitoring of the situation on the ground.

Factors contributing to technological progress are new technologies, innovations both in the production of goods and services and in management processes, including the development of the urban environment. Cities are engines of economic growth (Lucas, 2001), which can be defined as an increase in income per capita (O'Sullivan, 2011). In

general, the economic development rate (growth⁸) is determined by the rate of capital growth (per worker – labor productivity), the technological progress rate (traditionally estimated by the number of new ideas – patents) and the growth rate of human capital (in terms of quantitative increase and quality improvement).

Innovation plays a significant role in a city. If we compare two cities of equal population size, then even in the absence of migration the utility curve will shift upwards in the innovative city. Further, innovativeness will attract a highly skilled labor force, a highly educated population, and a creative class (O’Sullivan, 2011), it will improve the quality of human capital and stimulate further development of technology.

Undoubtedly, the most important driver of city development is the administrative and managerial resource: the governor, the mayor, the head of the settlement and their teams. The study of the activities of the governing bodies could be the subject of a full-fledged independent study. Here we will rely on the results of activity, expressed in the achieved social and economic indicators.

The scientific hypothesis of the study is that the socio-economic situation in small and medium-sized cities is primarily positively affected by investment in fixed capital and only afterwards by such factors as an increase in housing stock, educational development, the work of sports and cultural institutions.

Research methodology

We propose to analyze the trends and drivers of socio-economic development of small and medium-sized cities according to the following scheme.

1. To evaluate the distribution of cities according to population size using the “rank-size”

⁸ We believe that a city’s economic development is a somewhat vague definition, as it may include more than specific changes that are measurable. Economic growth is a well-established concept, subject to evaluation using certain methods.

rule (Zipf’s law), and to determine trends in development in dynamics. Zipf’s law is used to analyze empirical distribution patterns, in our case cities by population size. The application of this indicator is possible at the level of individual countries, federal districts (see, e.g., Rastvortseva and Manaeva, 2020), and regions. In our opinion, the possibility of applying Zipf’s law for the constituent entities of the Russian Federation is substantiated by two conditions. First, the region must have a sufficient number of cities to construct the curve. Second, the region must have an established system of urban settlements. The Belgorod Oblast was formed in 1954, and its boundaries have not changed since then. We can assert that the system of cities in the region is quite established, formed in accordance with the development of productive forces in the oblast, the system of health care, school, secondary vocational and higher education, retail trade, etc. A region is an independent system for applying Zipf’s law when analyzing the distribution of cities according to population size, especially in dynamics. However, inclusion of the region in larger systems: Central Black Earth Region, Central Federal District, Russia (as a whole or in parts, see, e.g., Kolomak, 2014) is also possible and expedient for obtaining new information. It is important to remember that “...a deviation from Zipf’s law cannot be considered a valid basis for practical decisions concerning the management of the urban system’s development” (Kolomak, 2016, p. 128).

At this stage, it is advisable that the analysis should include some rural settlements whose population is growing rapidly (often due to their closeness to large agglomerations), sometimes exceeding the indicators of urban-type settlements. Such settlements may not belong to cities for a long time for administrative reasons, but they contribute to the settlement system of the region.

2. To build a series of econometric models of the factors' influence on the economic development of cities:

$$Y_{econ} = F(K, L, Ed, H, S),$$

where Y_{econ} – dependent variable of economic development,

K – physical capital indicator,

L – labor,

Ed – education,

H – housing supply,

S – sports facilities.

3. To build a similar series of models of the factors' influence on the social development of cities:

$$Y_{soc} = F(K, H, C, S),$$

where Y_{soc} – dependent variable of social development,

C – indicators of the development of cultural facilities.

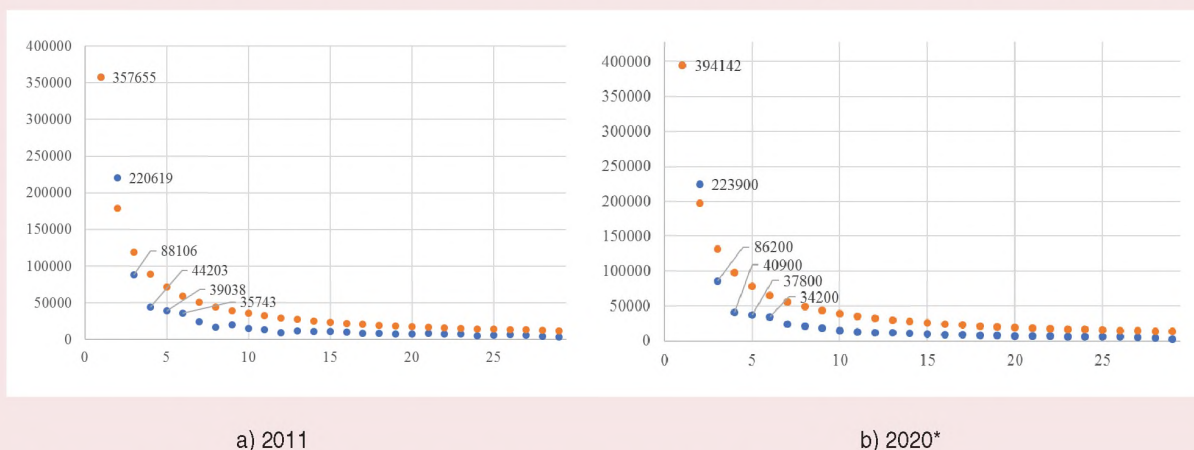
4. To interpret the results obtained.

The analysis (paragraph 2 and 3) will be carried out by the least squares method with the use of panel data. The study period is 2006–2021, the object of the study is 29 small and medium-sized cities of the Belgorod Oblast (in this case, a city is an urban settlement which is a municipal entity). For all cities and urban-type settlements we used data from the “Municipal Statistics” section of the database “Indicators of Municipal Structures” of Belgorodstat. In cases where statistical data is not presented for the entire study period, it is limited automatically⁹.

The object of research analysis

As of 2021, there are 11 cities and 18 urban-type settlements in the Belgorod Oblast. The largest city, the administrative center, is Belgorod (population – 394,000 people as of January 1, 2020). Traditionally, the second largest city is Stary Oskol, the center of ferrous metallurgy. Its population is 224,000 people. The third city in the region is

Figure 2. Graph of the distribution of cities in the Belgorod Oblast by population size in 2011 and 2020 (in blue – actual data, in red – the normative value according to the rule “rank-size” / Zipf’s law)



* Data for the urban-type settlements of Urazovo, Tomarovka, Yakovlevo, Troitsky for 2019.
Source: compiled according to the database “Indicators of Municipal Structures” of Belgorodstat.

⁹ For example, models 1.2, 2.3 are limited to 2017, as there is no statistical data on the number of students in general education institutions, employees of cultural and leisure organizations in the database of municipalities of the Belgorod region.

Gubkin – a single-industry town, since 2018 a territory of advanced socio-economic development – with 86,000 people. The category with a population of 20,000–5,000 people includes five cities, 10,000–20,000 people – 7, up to 10, 000 – 14. Maslova Pristan was a rural settlement until 2019, with a population of about 6,000.

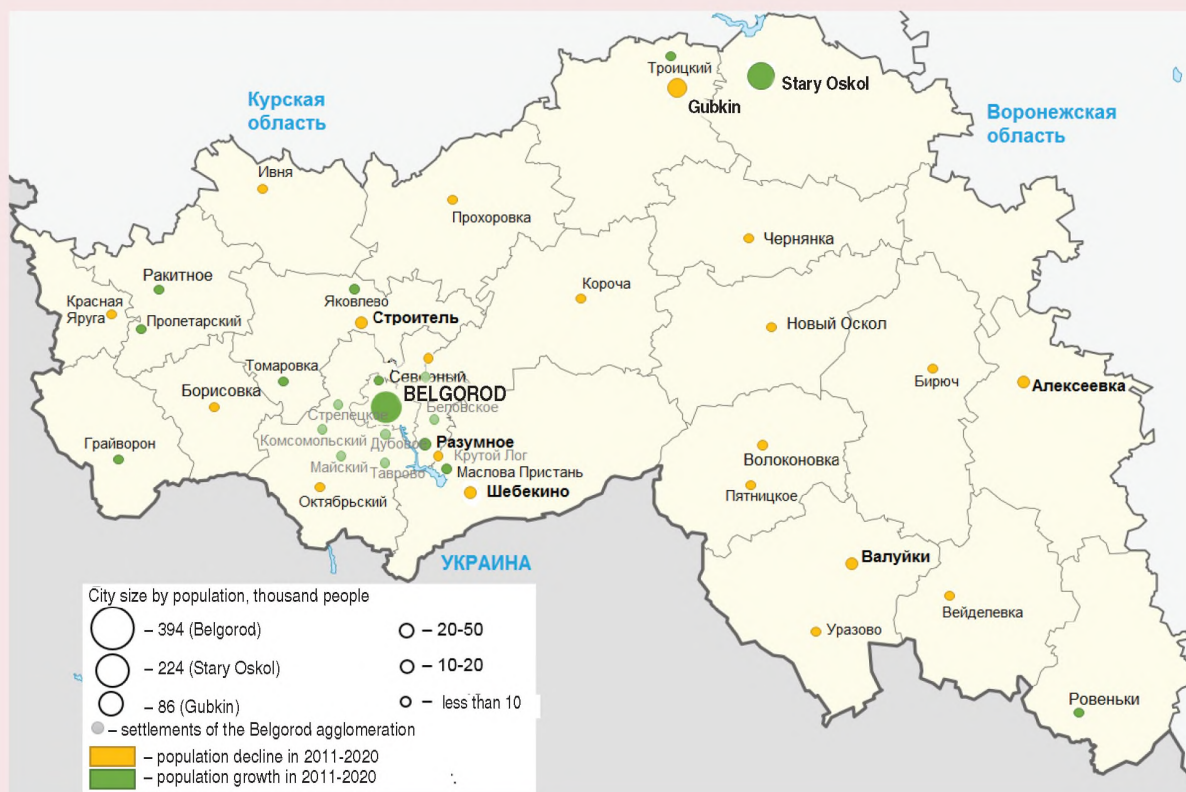
Population urbanization processes have been taking place in the Belgorod Oblast for more than 60 years (Chugunova et al., 2013). Today, it has entered a mature stage – the growth rate of large cities is slowing down, the region’s inhabitants tend to settle near cities, stimulating the growth of smaller settlements. The distribution within the urban system is changing (Fig. 2).

The first conclusion that can be drawn from the distribution of the number of cities in the Belgorod

Oblast is the absence (omission) of a “third” city with a population of 131 thousand. The oblast’s second city – Stary Oskol – significantly (by 19.4% in 2020) exceeds the normative value according to the “rank-size” rule. Further, we can note that the number of cities is somewhat lower than the standard, which is set by Belgorod. If in 2011 Gubkin was slightly behind the third place in the ranking of cities, in 2020 it is already behind the fourth place. All this indicates a growing differentiation of cities by the population size.

Divergence trends are confirmed by a simple analysis of growth dynamics (Fig. 3). We can see that the two largest cities are still growing. The population growth rate in Belgorod was 10.2% (since 2011), in Stary Oskol – 1.5%. Slight growth is observed in the west of the oblast – in Rakitiansky

Figure 3. System of cities and urban-type settlements of Belgorod Oblast in 2020



Source: compiled according to the database “Indicators of Municipal Structures” of Belgorodstat.

Table 1. Indicators of some rural settlements near Belgorod

Settlement	Distance to Belgorod, km	Population size in 2021, people	Population growth rate for 2011–2021, %
Dubovoye	8	13,215	43.92
Streletskoe	9.5	9,710	41.42
Novosadovy	11.5	7,089	131.74
Belovskoe	12.3	4,244	1.39
Tavrovo	13.1	6,003	13.91
Maisky	14.7	11,212	14.47
Belomestnoye	14.8	2,318*	-2.19
Komsomolsky	18	2,532	10.28
Krutoy Log	18	1,671	-3.86

* Data for 2019.
Source: compiled according to the database "Indicators of Municipal Structures" of Belgorodstat; mapping services to determine distances.

District (Rakitnoye urban-type settlement by 1.28% and Proletarsky – by 3.68%), in Grayvoron – by 0.74%. In the urban-type settlement of Rovenki, the most distant from the oblast center, the increase was 4.25%.

We should note the dynamics of small cities and urban-type settlements near Belgorod. Some growth is observed in Yakovlevsky District (0.95% in Tomarovka and 0.75% in Yakovlevo for 2011–2019). Much faster growth was observed in Belgorod's satellite settlements: Razumnoye urban-type settlement (population in 2021 – 21,247 people; distance 11.1 km) – 27.8%, Severnoye (12,281 people; 9.5 km) – 20.8%. The rural settlements around Belgorod were actively developing (*Tab. 1*).

Thus, closeness to a major population center does not guarantee positive development for a city or town. It is necessary to identify a set of other, non-geographic, factors and conditions that would stimulate growth.

Models of the influence of factors on the modern socio-economic development of small and medium-sized cities

Let us analyze some indicators of the development of small and medium-sized cities (urban-type settlements) in the Belgorod Oblast. In the region there is a positive dynamics of local budget revenues, including per capita. The comparative analysis revealed no correlation between the size

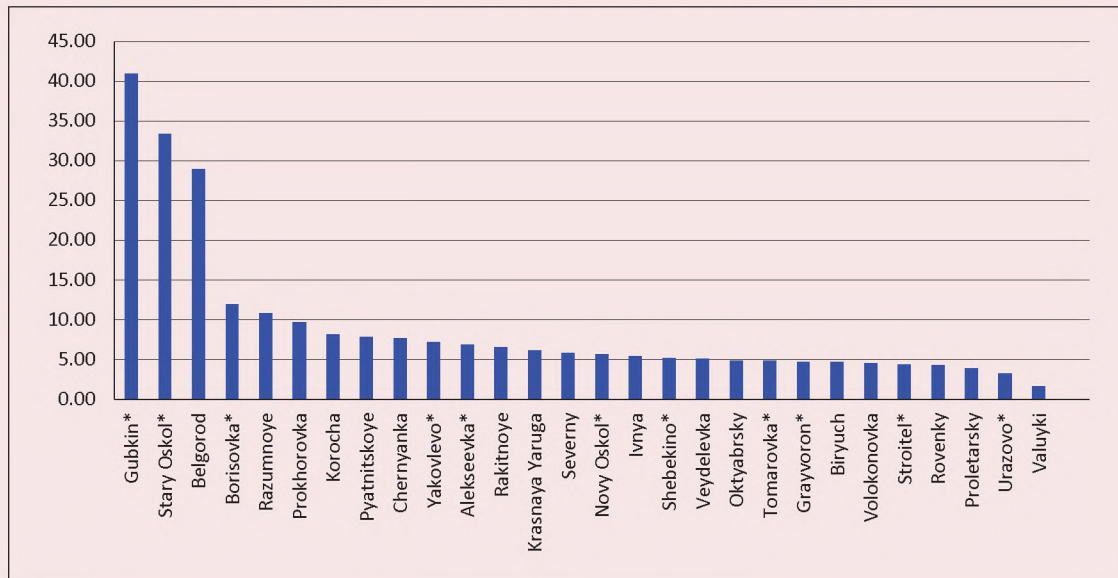
of the city by number of inhabitants and the size of the budget per capita – population growth is not an unconditional factor in increasing the city's budget. *Figure 4* shows the ranking of settlements in the Belgorod Oblast by per capita income of the local budget in 2019. We can see that the regional center is in third place, behind the cities where the mining industry is developed – Gubkin and Stary Oskol.

In some settlements, from time to time there is a significant increase in the per capita income of the local budget. The reason for this may be the improvement of the economic situation, the growth of the population's income and deductible taxes and one-time revenues from the budgetary system of the Russian Federation, subsidies and transfers (*Tab. 2*).

Gratuitous receipts from other budgets, subsidies and transfers can be spent on the implementation of specific investment projects or solving current problems. We can judge the effectiveness of such receipts after some time – either they have a positive impact on the development of the city and stimulate the growth of local budget revenues from their own funds, or the financial situation in the city does not change.

Let us consider the dynamics of the number of students in general educational organizations. Slight reductions compared to 2006 occurred in Volokonovka, Pyatnitsky, Ivna, Biryuch, Rovenky

Figure 4. Distribution of cities and urban settlements of the Belgorod Oblast by local budget income per capita in 2019, thousand rubles per 1 inhabitant



* Data for 2018.

Source: compiled according to the database "Indicators of Municipal Structures" of Belgorodstat.

Table 2. Sources of revenue growth of local budgets in some settlements of the Belgorod Oblast in 2006–2020

Settlement	Donations from other budgets of the budgetary system of the Russian Federation	Interbudget subsidies	Other inter-budget transfers	Subsidies to the budgets of RF budget system	Income from sale of tangible and intangible assets	Taxes on personal income	Property taxes	Personal property tax	Land tax	Taxes on total income
Oktyabrsky	2020									
Razumnoye						2019*				
Severny	2012	2012	2012							
Veydelevka	2009–2011		2009–2011							
Pyatnitskoe	2012	2012	2008–2011		2011					
Korocha	2008	2008				2008				
Krasnaya Yaruga	2020	2020								2020
Prokhorovka	2008–2011, 2019–2020	2019–2020	2008–2011, 2019–2020	2019–2020						
Proletarsky	2011–2012		2011–2012							2011–2012
Chernyanka	2012, 2014, 2019	2012, 2014, 2019								
Yakovlevo	2008, 2011					2018	2018	2018	2018	

* Rather wrong, corrected in 2020.

Source: compiled according to the database "Indicators of Municipal Structures" of Belgorodstat.

and Yakovlevo. The number of schoolchildren grew in all other settlements, especially in Belgorod (23.84%), the nearest settlements – Severny (82.45%), Razumnoy (37.8%), Stroitel (48.54%), as well as Alekseevka, Tomarovka and others.

As the resulting indicators of socio-economic development of the city, we consider the revenues of the local budget (*l_budget*) and the population (*l_popul*). The budget includes tax revenues, revenues from the use and sale of state and municipal property, profits of state and municipal enterprises, etc. In view of the fact that (with few exceptions) local budget revenues in the cities of the Belgorod Oblast are entirely own revenues, we can conclude that this indicator is a relevant reflection of economic development.

The population size, with noticeable changes in its distribution in cities and urban-type settlements of the region, reflects social development. In small settlements, this indicator is sensitive – when the standard of living declines, the population decreases due to the migration of people to more prosperous settlements, large cities or outside the region, as well as due to natural decline in population. And vice versa, cities with a high level of development become attractive for residents of the region and

newcomers (for the Belgorod Oblast, these are often pensioners from the North).

As factor indicators we determine the number of students of general educational organizations (*l_school_learn*), the size of the housing stock (*l_houses*), investment in fixed capital and funds for shared construction (*l_invest*), the number of sports facilities (*l_sport*) and the number of employees of cultural and leisure type organizations (*l_culture*).

Using the method of least squares, we build two groups of models: the impact of factors on local budget revenues (*Tab. 3*) and the population (*Tab. 4*). We checked for multicollinearity by the method of inflation factors (calculation of the variance bloating coefficient).

The main growth factor contributing to local budget revenues is the population size. Its increase by 1% leads to the growth of revenues by 1,147%. When other factors are included in the model, school education, creation of favorable conditions for the economy (investment in fixed capital), development of sports and housing conditions are seen as priorities. It is noteworthy that the number of schoolchildren plays an even greater role than the total number of residents of the city or town. This indicator, as well as investments in fixed

Table 3. The results of modeling the influence of factors on local budget revenues in cities and urban-type settlements of the Belgorod Oblast, 2006–2020

Variable	Model 1.1	Model 1.2	Model 1.3	Model 1.4
<i>const</i>		2.423** (0.589)	0.239 (2.064)	
<i>l_popul</i>	1.147*** (0.012)		0.895*** (0.248)	1.077*** (0.026)
<i>l_school_learn</i>		1.15*** (0.084)		
<i>l_houses</i>			0.229** (0.126)	
<i>l_invest</i>				0.720* (0.036)
<i>l_sport</i>				
<i>Standard model error</i>	0.703	0.627	0.656	0.648
<i>R²</i>	0.750	0.753	0.758	0.772
<i>Number of observations</i>	295	288	266	255
*** Significance level is 1%; ** 5%; * 10%. Standard error is given in parentheses. Source: own compilation; models are based on the database "Indicators of Municipal Structures" of Belgorodstat.				

Table 4. The results of modeling the influence of factors on the population of cities and urban-type settlements of the Belgorod Oblast, 2006–2020.

Variable	Model 1.1	Model 1.2	Model 1.3	Model 1.4
const	2.828** (1.141)	2.656*** (0.864)	2.721*** (0.629)	4.302*** (0.347)
I_houses	0.737*** (0.131)	0.674*** (0.101)	0.569*** (0.073)	0.301*** (0.051)
I_invest		0.878** (0.033)		
I_culture			0.407*** (0.062)	
I_sport				0.665*** (0.077)
Standard model error	0.588	0.527	0.456	0.348
R²	0.677	0.746	0.808	0.887
Number of observations	275	262	238	274
*** The significance level is 1%; ** 5%; * 0%. The standard error is given in parentheses. Source: own compilation; models are based on the database "Indicators of Municipal Structures" of Belgorodstat.				

capital, positively affects the amount of income of the local budget and forms the future appearance of the city.

The dynamics of the population of cities and urban-type settlements are due to a large number of factors, not all of which are included in the model. The most significant of them can be considered investment in fixed capital. It is the economy of a settlement that is the basis of its development. The availability of housing is important for the city: the growth of the housing stock by 1% stimulates an increase in the population by 0.737%. Creation of conditions for sports and development of cultural and leisure sector become significant factors. We should note that the latter factor was not statistically significant for the growth of local budget revenues.

Interpretation of the research findings

The testing of the proposed methodological approach to the determination of development trends and drivers in small and medium-sized cities of the Belgorod Oblast allowed drawing some conclusions. The analysis of the distribution of cities according to Zipf's law showed that the size of the main city of the oblast – Belgorod – sets higher standards for the number of inhabitants in other cities, with the exception of Stary Oskol. In the

dynamics, the size of the region's cities changes due to internal and external migration and natural population movement in such a way that divergence trends intensify. More in-depth conclusions about the trends of urban development could be drawn on the basis of the analysis of such indicators as, for example, the average wages of workers by industry. It is noteworthy that significant population growth rates take place in rural settlements, some of which can already be classified as urban settlements according to this indicator. They are mostly all located near Belgorod, but their association with the regional center would further disrupt the distribution in the urban system.

Let us consider to what extent the hypothesis of the study is confirmed. First of all, the assumption of a significant positive impact of investment in fixed capital on the development of small and medium-sized cities is confirmed. Of course, the "labor" factor plays a greater role (Model 1.4 shows that local budget revenues will increase by 1.077% if the city's population grows by 1%) than the "capital" factor (by 0.72%). This is consistent with the provisions of economic theory. But the role of investment in small and medium-sized cities in the Belgorod Oblast is significant, which should be taken into account in local policy.

The assumption that an increase in the housing stock has a positive effect on the development of small and medium-sized cities is confirmed. A 1% increase in housing stock is accompanied by a 0.229% increase in local revenues (Model 1.3) and a 0.301–0.737% increase in population (Models 2.1–2.4). The housing issue remains a topical one. Local governments need to take into account the housing needs of the population for urban development.

The hypothesis of a positive influence of such factors as education, sports, and culture on the development of small and medium-sized cities is also confirmed. The development of general education in cities has a positive effect on economic indicators (more than the total population). A 1% increase in the number of students is accompanied by a 0.785% increase in local budget revenues (Model 1.2). Sport also has a positive influence, increasing the economic indicator by 0.392% (Model 1.5) and the social indicator by 0.665% (Model 2.4). Cultural development is reflected only on the population (by 0.407%, Model 2.3). We can assume that the influence of education, sport and culture is indirect, but it exists.

Thus, the importance of the economic component in small and medium-sized cities in the Belgorod Oblast is influenced to a greater extent by the number of inhabitants, especially those studying at school institutions, and the amount of investment in fixed capital. The growth of the population in small and medium-sized cities is stimulated not only by economic factors, but also by the provision of housing, the creation of conditions for sports and cultural and leisure development.

Conclusion

Modern trends in the development of small and medium-sized cities require new approaches to the development and implementation of socio-economic policies based on the results of an in-depth analysis of the dynamics of growth, place of the city in the overall regional system of settlement, factors and conditions.

The totality of urban development drivers in the works of scientists has become more diverse in recent decades, but for Russian researchers it remains very limited due to incomplete statistics. Among the factors, geographical and non-geographical (physical capital, human resources and technological progress) can be distinguished.

The scientific novelty for the research consists in proposing the methodology of determining the trends and drivers of development of small and medium-sized cities, which differs from traditional approaches by including the analysis of the distribution of cities in the regional system (according to Zipf's law) in the dynamics, and building a system of econometric models of the influence of factors on social and economic development. The proposed approach allows regional and local governments to pursue a more targeted development policy, understanding not only the current situation within the city, but also its role and place in the overall system of cities in the region.

The scientific hypothesis that in the first place the socio-economic situation in small and medium-sized cities is positively influenced by investment in fixed capital and only then by such factors as an increase in housing stock, development of education, sports and cultural institutions, has been confirmed.

In the future, it is advisable to conduct a study of the interconnection and inclusion of cities in the overall socio-economic system of the region. Thus, significant factors may include the distance between cities, the established transport system, the possibility and necessity of trips of inhabitants of small and medium-sized cities to larger centers for work (push-pull migration), etc. The results of the study are of practical value for the design and implementation of development policies for small and medium-sized cities in Russia.

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