

Functional Potential of the Novosibirsk Urban Region in Russian Federation

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ABSTRACT— *The research presented in this article focuses on the urban region of Novosibirsk, which is one of the most industrialized part of Siberia and the Asian part of Russian Federation. The research was based on two methods of determining the functions of cities in the national settlement system: a research programme concerning the genesis of functional development and a research programme of specialized functions, the purpose of which is to determine the economic base of territorial units.*

To show relationships between the core of the region and its peripheral area there was provided a case study analyzing the territorial units forming the southern settlement belt along the Novosibirsk-Cherepanovo regional railway line over a distance of approx. 100 km. The presented results have shown the general tendencies in the transformations of the Novosibirsk urban region both in long-term perspective and in contemporary circumstances.

Keywords—industrialized urban region, economic base, functional structure

1. INTRODUCTION

Each region is a territorial social system which, due to various external and internal factors, changes over time in economic, social and spatial terms [1]. In addition to the demographic, social and economic aspects, these transformations are also spatial. From the standpoint of economic geography, changes in the spatial structure of respective settlement systems are important. These structures are most often identified and interpreted in the context of various imbalances in spatial planning, which refers primarily to the assessment of changes in the functional and morphological areas.

This paper focuses primarily on functional and spatial transformations of the urban region of Novosibirsk, as a settlement subsystem, in which strict (direct) relationships between the city as the core of the region and its peripheral area (area of influence of the core) can be seen. The formation of an urban region is an effect of functional specialization (specialized areas) on a regional scale [4, 6]. The concept of “urban region” (“functional region”) refers to the observation of the daily movements of the population, with the relationships within the regional public transport system.

The functional analyses in this paper concern the whole core of the urban region, i.e. the city of Novosibirsk and its direct vicinity (Novosibirskiy District)¹. In the peripheral area of the urban region a case study was conducted (fig. 1). The case study analyses the territorial (administrative) units forming the southern settlement belt along the Novosibirsk-Cherepanovo railway (the terminal station of regional railway) over a distance of approx. 100 km. This belt was chosen not only because of the continuity of the settlement, but also due to the presence of different functional types of edge towns, from Berdsk, tightly connected to the core, through Iskitim, intensely industrialized during the Soviet era to Cherepanovo - a peripheral local center. The adopted system, from the core to the area of weakening direct links to Novosibirsk, helped to define the directional profile of the urban region as relating to the economic characteristics. In the Introduction section, present clearly and briefly the problem investigated, with relevant references. The main results should be enunciated.

¹ The Novosibirsk urban (functional) region includes the south-eastern part of the administrative region.

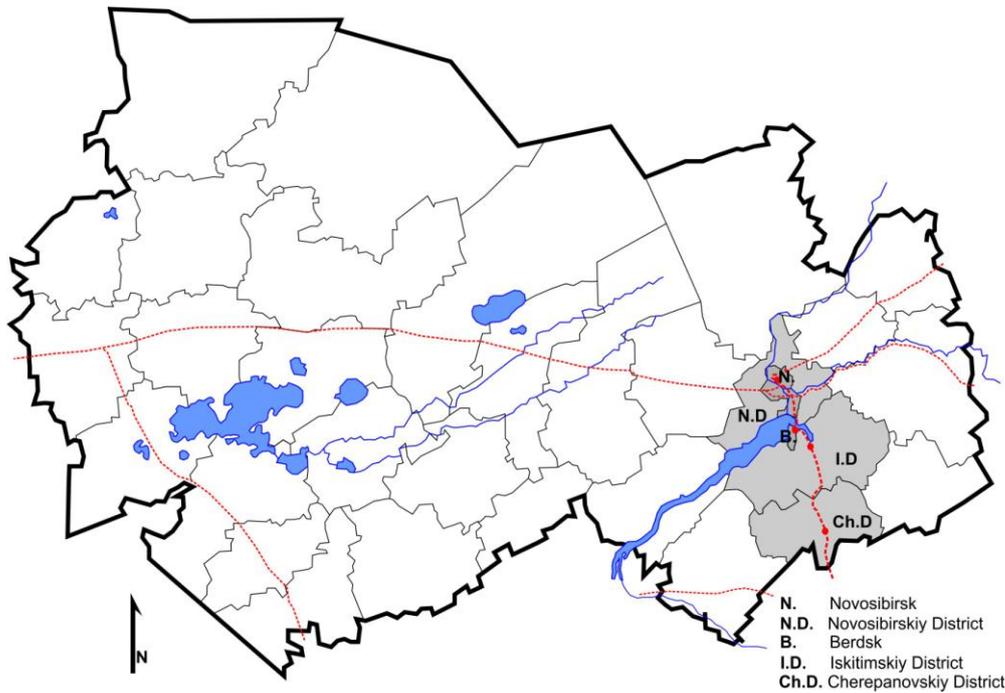


Figure 1: The territorial units selected for the study against the administrative division of Novosibirskiy Region into districts

Research methodology refers to the functional concept that has been developed in economic geography since the 1940s [2, 3, 9]. In this case, we focused on two methods of determining the roles (functions) of cities in the national settlement system, namely

- a research programme concerning the genesis of functional development, which focuses on the evolution of the functional development of cities (urban regions), viewed as a historical process. Research in this area relies on a specific “reading” of the history of the city, in which certain stages can be distinguished in relation to functional factors, the processes of functional transformations and their effects in the form of respective functions (functional structure) and the institutions responsible for their existence;

- a research programme of specialised functions, the purpose of which is to determine the economic base (exogenous functions) of territorial units. The economic base is the sector of activity in a given city, which is responsible for the creation of relationships with its surrounding, and thus the formation of the settlement system of the country [8, 9].

2. THE GENESIS OF THE DEVELOPMENT OF FUNCTIONS IN NOVOSIBIRSK URBAN REGION

The functional history of Novosibirsk is discussed by distinguishing four processes that form the functional structure of the city and six stages that generalize the character and behavior of the most important functions (fig. 3). A characteristic feature of this case is that functional changes mostly depend on external factors, which usually result in strong dynamism of functional processes. The history of Novosibirsk shows how the sequence of decisions taken by the central government led to the creation of the strongest urban region of the Asian part of Russia within the Siberian taiga.

The first stage is associated with the colonization of Siberia by the Russians, which took place in the seventeenth and eighteenth centuries. Back then, the area now occupied by Novosibirsk was a series of settlements with agricultural, craft and trade functions. At the end of the nineteenth century, Tsar Alexander III issued a decision to route the main line of the Trans-Siberian railway through the area (Ob station). Owing to the extremely favorable geographical location at the intersection of important routes, the Trans-Siberian railway line (linking Siberia and the European part of Russia) and near the navigable river Ob connecting the north and south of Siberia, Novonikolayevsk (later Novosibirsk - a settlement on the right bank of the river), was quickly developing and received municipal rights in 1903. The railway bridge over the river Ob marked the main compositional axis of the city - Novonikolayevskiy Prospect (Krasnyi Prospect today), along which the marketplace and development plots were plotted [5] (fig. 2). The Trans-Siberian Railway which required continuous expansion was a very important factor in the development of industry in the city. Agricultural machinery and food processing plants were created.

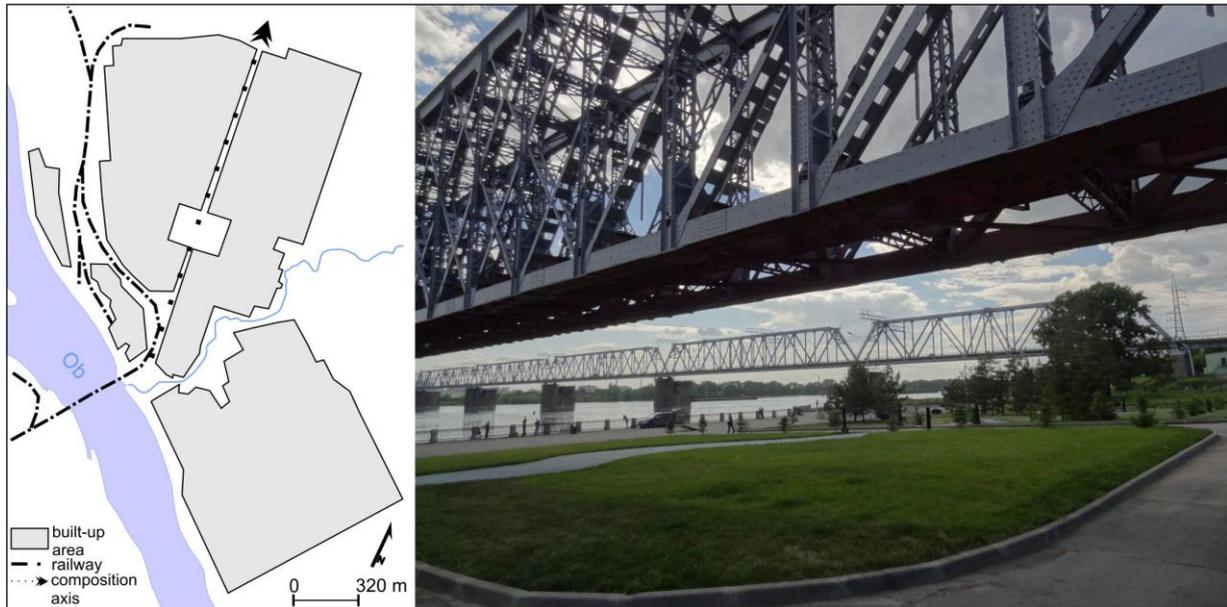


Figure 2: The spatial structure of Novosibirsk in 1906 and the railway bridge on the river Ob.
In the foreground a span of the bridge from 1893

After a period of political and economic instability caused by revolutions and civil war in Russia in 1917-1920, a phase of dynamic development of the city followed, which was associated with the New Economic Policy by V. Lenin and the rule of J. Stalin. There were investments in railway infrastructure (new connections between the city and the south of the country, as well as the Kuznetsk Basin) and the industry, including the construction of a new port. At the same time, public buildings were created and the construction of the first tram line in the city was started. Rapid population growth necessitated massive investments in housing. Authorities invested in education. The city extended in the style of slowly emerging socialist realism. Broad tracts and spacious squares meant as meeting places for the inhabitants dominated. Newly constructed buildings used numerous decorative elements such as attics, colonnades, pilasters, high ground floors, which gave them monumental character [5]. During this period, along with the expansion of regional railway connections, town rights were given to rural settlements around Novosibirsk such as: Cherepanovo (1925), Berdsk (1929), Iskitim (1938), with dominant industrial functions (extraction of raw rock, mineral industry, construction, food industry), forming the seeds of industrialized urban region.

The second stage of the dynamic development of Novosibirsk under the centrally planned (communist) economy, were the years 1941-1945, when over 300 industrial plants from the western part of the USSR were evacuated to the city. The production profile changed from light industry to heavy industry (mainly armaments). Most of the plants functioning during the war were provisional, often occupying public buildings such as schools or churches. The dynamic development of industrial functions took place at the expense of a recession in other municipal functions - especially residential, cultural and educational.

After World War II, during the Cold War and the arms race, the plans of the central authorities of the USSR assumed the further development of Novosibirsk as a major heavy industry and process engineering centre [7]. To this end, modernisation of existing plants and the construction of new ones started, with both mostly associated with defence industry. The city became an important centre for the machinery, electronics, chemical industries, as well as metallurgy and mining. The accumulation of large industrial plants required the creation of scientific and research base. In addition to the Siberian Branch of the Academy of Sciences of the USSR, several specialised higher education institutions were created. In 1957, the Council of Ministers of the USSR approved plans to establish the Akademgorodok research centre, which consisted of more than 40 research institutes, State University, as well as housing facilities for researchers and students and a rich social infrastructure. This led to a rapid development of scientific, housing and educational functions of the city, while significantly expanding its spatial range southwards [5]. The same year, a new Tolmachevo airport was opened, which further strengthened the strategic (in terms of communication) location of the city. The 1960s and 70s saw intensive development of residential areas based on the prefabrication technology, as well as the technical and social infrastructure of Novosibirsk and other cities in its agglomeration. Parks, greeneries and recreational areas were created. Works on a subway system were also started. The 1980s were characterised by economic slowdown and the end of large investments.

The political and economic transformations of the 1990s caused by the dissolution of the USSR and the transfer to market economy led to the closure of numerous plants and factories, as well as to the previously unknown level of

unemployment. Currently, Novosibirsk is rebuilding its former importance. The city is the administrative centre of the Novosibirsk Region and the Siberian Federal District. In addition to powerful industrial plants, the city has a rapidly growing service sector providing primarily services for manufacturers and businesses, as well as commerce. The process of adapting the functional structure of the city to the new political and economic conditions can also be seen in the micro scale, in the Akademgorodok scientific and research centre, which is expanding due to the inflow of foreign capital and new investments associated with the high-tech industry. In 2006, at the initiative of the Siberian Branch of the Russian Academy of Sciences, as well as the authorities of the city and the region, a technological park was created to support innovative enterprises.

Transformations of the functional structure of Novosibirsk in new political and economic conditions after 1991 were directly reflected in the spatial structure of the whole urban region. When subjected to the laws of the market, space transforms in both quantitative and qualitative dimension. New forms of development emerged such as shopping centres, banks, office buildings, mainly related to the influx of foreign capital, often contrasting with the existing 19th and 20th-century building in city centres. There is also a concurrent development of housing areas, which reflects both new regulations in the free property market and the growing demand for higher-standard housing, as well as the need to isolate from the surrounding. As a result, housing estates built in the 1970s from prefabricated concrete that served as a symbol of the policy of egalitarianism undergo gradual decapitalisation, while new, fenced-off housing estates are created in the suburbs. New forms of buildings in the urban areas of Novosibirsk contribute to the increase in their mosaic nature, while closing the gap between them and western European cities in terms of appearance and function.

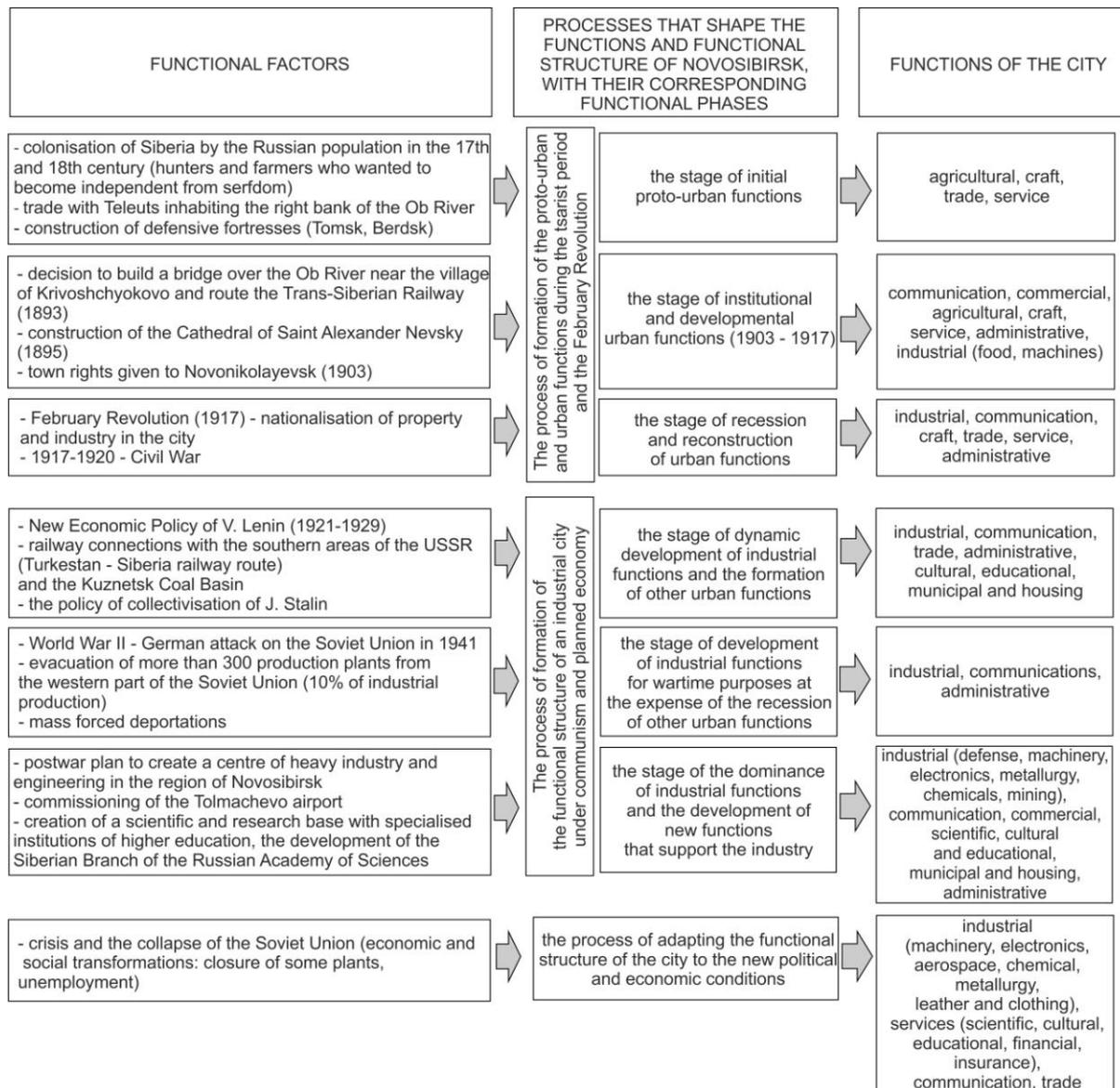


Figure 3: The model of transformation processes in the functions of the functional structure of Novosibirsk

3. ECONOMIC FUNCTIONS IN NOVOSIBIRSK URBAN REGION

First, the share of the core of the Novosibirsk urban region in the employment in the main sectors of the economy in the overall employment in Russia² was determined (tab. 1). According to the initial assumption, the core means Novosibirsk city and the surrounding Novosibirsk Municipal District. The surrounding area can be equated with the suburban zone of Novosibirsk, which is an area with the closest functional links with the region's capital.

Table 1: The share of employment of the core of the urban region in the total employment of the Russian Federation

sector of the economy	Novosibirsk City and Novosibirsk Municipal District	The Russian Federation	share (%) of Novosibirsk City and Novosibirsk Municipal District in the Russian Federation
A - agriculture, hunting and forestry	3441	6428000	0,05
B - fishing	79	142000	0,06
C - mining and quarrying	338	1068000	0,03
D - manufacturing	76599	10230000	0,75
E - electricity, gas and water supply	19402	1960000	0,99
F - construction	14508	5581000	0,26
G - wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	44650	12400000	0,36
H - hotels and restaurants	3888	1250000	0,31
I - transport and communications	40537	5381000	0,75
J - financial intermediation	18909	1215000	1,56
K - real estate, renting and business activities	54153	5657000	0,96
L - public administration and defence, compulsory social security	44618	3760000	1,19
M - education	56934	5711000	1,00
N - health and social work	49662	4597000	1,08
O - other community, social and personal service activities	16107	2532000	0,64
total employment	443825	67912000	0,65

In 2012, the part with most investment, i.e. the core of the Novosibirsk urban region, employed approx. 444 thousand people. The share of the area surrounding Novosibirsk (Novosibirsk Municipal District) in the total employment of the core was only about 5% (with a population share of approx. 8%). Indirectly, this indicates the presence of other functions in the direct suburban area, whose identification requires a different type of information (residential, recreational, suburban farming areas, etc.). The share of employment of the core of the urban region in the total employment of the Russian Federation was 0.65%. Taking into account the different economic sectors of the core of the urban region, we can see significant disproportions in that regard (tab. 1). The core of the urban region plays a significant role in the case of sectors, whose share exceeds the overall share of this region in the national economy (over 0.65%). A preliminary assessment of the role of different sectors of the economy shows an important role played by Novosibirsk as a centre with important social functions, such as public administration and defence, compulsory social security, health and social work and education, as well as those that determined the city's path dependency in developing functional processes (city-forming functions), such as manufacturing, electricity, gas and water supply and transport. The contemporary role of Novosibirsk is mainly shaped by employment in financial intermediation (the highest share among all branches) and real estate, renting and business activities.

² Source of data: www.gks.ru. The study focuses on the most recent available data (2012). A comparison of available data for the years 2010-2012 revealed no significant differences in the overall level and structure of employment nor, as a consequence of the adopted research procedures, in the exogenous employment structure. Identification of the economic base (exogenous functions) in selected areas is based on the 2012 data.

We can clearly see functional dominants in the structure of employment determined by the number of employees in different sectors of economy. The main conclusion is the dominance of two large groups of employment. The first one is related to the activities of the institutions connected with the functioning of the state, region and local structures of authority, as well as financial sectors from public finances that meet the community's needs. Activities in education, health and social work, public administration and defence, compulsory social security in 2012 accounted for approximately 34% of the total number of persons employed in the core of the urban region (444 thousand employees). Sectors that determined the development of Novosibirsk, i.e. industrial manufacturing (including energy production and supply and construction) accounted for approx. 25% of employees. We also have to include approx. 9% working in transport and communications. Dynamic service functions of the transformation period accounted in 2012 for approx. 20% of employees, mainly in wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods, financial intermediation.

Given the data concerning employment in administrative units located along the Novosibirsk - Cherepanovo railway (i.e. Berdsk, Iskitim and Cherepanovo), we should primarily point out their small social and economic potential as compared to the core of the urban region. In total, these three units employ around 51 thousand people (Berdsk City - about 15 thousand., Iskitim Municipal District and Iskitim City - about 26 thousand., Cherepanovo Municipal District - 9.8 thousand).

The main difference compared to the employment structure in the core of the urban region presented above is the more important role of employment in production sectors, mainly processing and excavation. In this respect, public sectors (funded by the state), such as administration, defence, education and healthcare are also more significant. In view of the dominance of these two groups, employment in commercial services such as commerce, repairs, financial and business activities is less prominent.

The level of development of exogenous functions (economic base) of Novosibirsk was estimated at 105 thousand employees (approximately 110 thousand including close suburban zone). Compared to the capital of the region, other administrative units in the study (Berdsk City, Iskitim Municipal District and Iskitim City, Cherepanovo Municipal District) were not significant in this regard in 2012 (total of approx. 17 thousand employees), similarly to the analysis of employment structure.

Taking into account the share of exogenous employment (economic base) in the overall employment, the openness of the economy of a given territory can be assessed (fig. 4). It was noted that lower values of this coefficient are characteristic for the core of the urban region (Novosibirsk and its suburban area), i.e. approximately 25%. This is primarily due to the development of a huge endogenous sector that provides a great concentration of population with basic and specialised commerce, transport, industry (e.g. food and textiles), energy production, educational and cultural services, as well as an increasingly important sector of professional services (banking, insurance, business services), that are especially important in shaping such centres.

Areas in the peripheral zone have higher economy openness indexes (approximately 30-35%). This is due primarily to the poor economic diversification of economies with relatively small overall potential dominated by large workplaces, industrial workplaces or workplaces founded by the state (public administration, defence, compulsory education, health and social work). The share of commercial activities is relatively small. These areas are served by Novosibirsk and numerous specialised businesses concentrated there (very high spatial concentration).

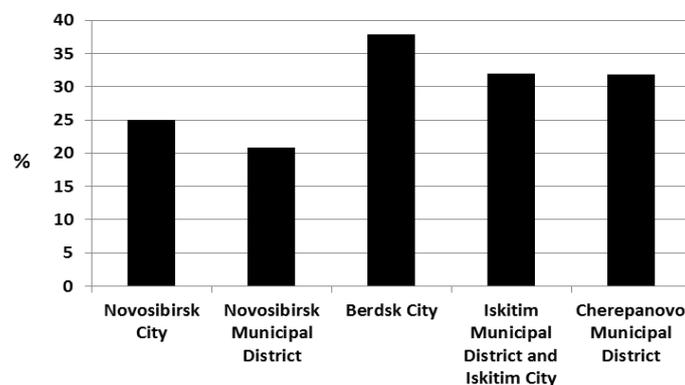


Figure 4: The level of openness of economies in selected administrative units in 2012 in the Novosibirsk urban region

Considering the above, the results of measurements of economic bases of territorial units in relation to the functional structure (fig. 5) are interesting, as they are crucial for this part of the study.

The functional structure is most diverse (8 exogenous functions) in the core of the urban region (the city of Novosibirsk). The most important components of the economic base are the functions directly controlled by the state, i.e. public administration, compulsory (the most important function), education, health and social work. Together they form around 55% of the economic base of the city. When we include transport, also largely dependent on the state, in this group, this share grows to 60%. The formation of metropolitan functions is significantly influenced by two groups of economic activity related to professional and commercial services, i.e. real estate, renting, business activities and financial intermediation (25% of the economic base). Functions that were of key importance for the formation of economic base of such centres in communist times are currently less influential in forming the settlement system of Russia. Manufacturing activity currently (2012) comprise approximately 15% of the economic base.

The economic base of the outer zone of the urban region consists of a smaller number of functions (7). In Berdsk City, Iskitim Municipal District and Iskitim City we can see a balance between manufacturing sectors (approx. 40-50%) and communal services. In contrast to the core of the urban region, the economic base lacks commercial services (Iskitim) or they are marginalised (Berdsk). On the other hand, the peripheries of the urban region (Cherepanovo), where the direct influence of the big city (Novosibirsk) is diminishing, the vast majority of the economic base consists of employment in state institutions, i.e. various types of schools, hospitals and healthcare institutions, offices and transport services. This economic base based on public service is complemented by the industry.

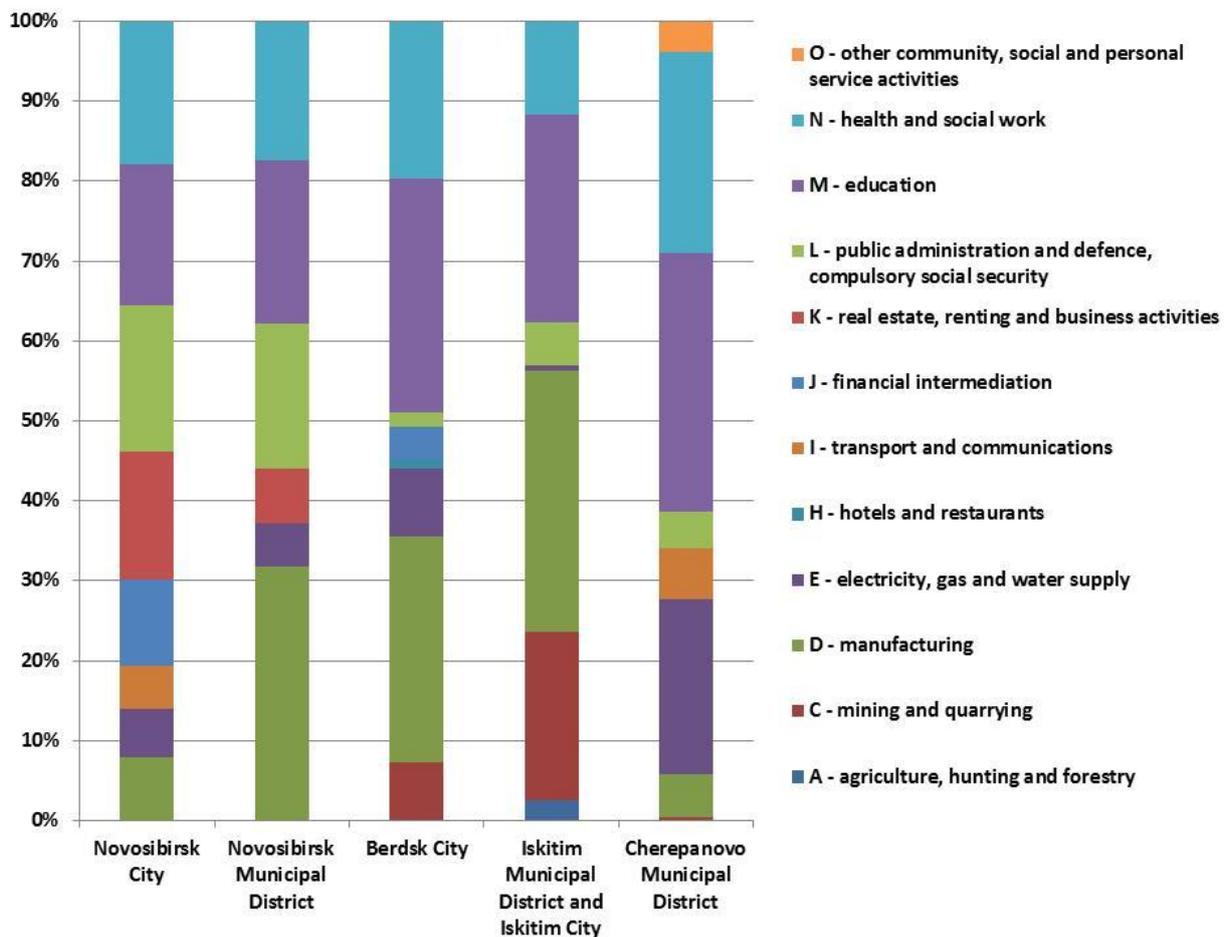


Figure 5: The size of the economic base of selected administrative units in 2012 in the Novosibirsk urban region

4. FINAL CONCLUSIONS

Research of the economic potential of the Novosibirsk urban region using directional profile method has shown systematically the general tendencies in the transformations of its spatial structure, both in long-term perspective and in contemporary circumstances related to the economic transformation of Russia. The main conclusions of the analysis

relate to the following processes of structures that shape the urban region of Novosibirsk:

1) the development of city-forming functions of Novosibirsk and the settlements connected to it (urban region) was the effect of political decisions, i.e. the construction of Trans-Siberian railway (Russian colonisation of Siberia and the Far East), as well as the location of industry within the zone not directly threatened by wartime activities (World War II), then the creation of other functions to support this industry, primarily scientific and higher education institutions;

2) Novosibirsk and the area in its direct vicinity became the biggest urban region in Siberia with strong industrial functions, high concentration of population and a well-developed sector of public services to serve the population (educational, scientific, healthcare, cultural and administrative functions);

3) In the first decade of the twenty-first century, Novosibirsk's economy experienced some growth and functional restructuring, especially related to the development of commercial and public services.

4) The economic base in the Novosibirsk urban region has a very high concentration of exogenous functions in the core, which creates considerable spatial disproportions in socio-economic development caused by extensive development of most of the Novosibirsk Region. The structure of the settlement network was formed based on the locations of specialised centres, especially in industrial activities. Contemporary functional weakness of local centres especially in multifunctional development, along with recession or relative stabilisation of industrial functions, leads to increasing disproportions in regional scale, which can in turn result to a crisis in the economic base of smaller towns and settlements.

5) The current structure of the economic base of the Novosibirsk urban region is a result of the functional reconstruction focused on the core (Novosibirsk city). This transformation is most characteristically evident in the decreasing significance of exogenous industrial functions (even though they are still relevant in the employment structure) accompanied by the growing importance of metropolitan functions, i.e. specialised services and stabilisation of state's financial activities at a high level.

6) The high share of government functions in the economic base, especially in the core of the urban region, is an expression of the impact of centralised state management policy. One interesting feature is the low importance of commerce in the employment structure and the lack thereof in the structure of the economic base, which may be evidence of commercial activity outside of the official circulation.

7) The identified structure of the economic base is not very beneficial to the formation of balanced urban functions and may be susceptible to various external influences in the future. The economic base of the Novosibirsk urban region depends to a large extent on the condition of the state budget, as a considerable portion of exogenous activities (forming the settlement system) is financed by the authorities (hierarchical dependence). A large share of industrial functions, including mining, in the structure of employment and economic base (especially in the peripheries of the region) of towns and settlements can cause adverse trends in the development in the case of larger crises, especially in the raw material market (decline in raw material prices). Given that the income from the sale of raw materials (especially energy-related) is one of the major incomes in the state budget, this can have a negative impact on public spending and on social functions.

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