

Urban Agglomeration Processes in Russia: Novosibirsk Case Study

Irina V. Volchkova

Maria N. Danilova

Yulia V. Podoprigora

Evgeniya N. Ufimceva

Nikolay R. Shadeyko

Tomsk State University of Architecture and Building, Russian Federation
Email: volchkovairina@bk.ru

Doi:10.5901/mjss.2015.v6n3s5p177

Abstract

The paper presents the analysis of the dynamics development of Novosibirsk urban agglomeration, as well as the study of development of Novosibirsk's city proper as compared to the similar indicators of its suburbs. The authors emphasize that the lack of statistical base about socioeconomic development of urban agglomerations in Russia and approach to the analysis of the statistical information largely complicate the study of the agglomeration processes. Research has revealed the development trends similar to both the city proper and the suburbs of Novosibirsk that allowed authors to draw a conclusion about feasibility of formation and development of urban agglomeration.

Keywords: urban agglomeration, city proper, suburbs, socioeconomic development, comparative analysis, correlation analysis

1. Introduction

Nowadays research carried out into agglomeration processes in Russia is becoming more relevant for the analysis of conditions and criteria of formation and development of urban agglomerations along with the study of their dynamics.

When studying regional agglomeration processes in Russia, it is necessary to take into account the fact that agglomeration cannot be considered only from the viewpoint of its quantitative characteristics (population, area, etc.) it is necessary to supplement the analysis with its qualitative characteristics. However, absence of statistical base and approaches to the analysis of statistical information makes it difficult to study the agglomeration processes. Moreover, the research of the certain urban agglomeration is also difficult to perform in terms of its completeness and sprawling. The researchers use mainly the guidelines of the Urban Development CNIIEP (Central Research Institute of Engineering Design) of the National Committee for Civil Engineering and Architecture and the Institute of Geography of the Russian Academy of Sciences (Lappo, 2007).

It is difficult to study formation, function and development of urban agglomerations in Russia; because of the absence of a common statistical base since urban agglomerations is not the subject of statistical research for today. Research techniques available for urban agglomerations do not allow for the present-day trends of the urban agglomeration dynamics. As a rule, they are based on peer review and have descriptive nature. However, the only research methodology base available still requires a considerable revision.

Therefore, it is advisable to develop new methodological approaches to studying the urban agglomeration processes in Russia which would allow detecting peculiarity of their formation and development, and also to develop and implement the efficient urban agglomeration models.

Based on the available guidelines and statistical base, the authors made an attempt to analyze the socioeconomic development of the urban agglomeration of Novosibirsk as well as to explore the level of development of the urban central place in comparison with the similar indicators of the suburbs - a residential area or a mixed use area, either existing as part of a city or urban area (because the suburbs' indicators depend on that of the urban central place).

A.I. Tatarin, the Russian economist, notes "the largest cities are the leaders of investment, innovative, and social processes, centres of economic growth. And the economic growth rate of all the countries in many respects depends on

their development strategy. These largest municipalities responsible for solving the territorial socioeconomic problems form mechanisms of the effective use of the regional potential and provide conditions for its economic growth" (Tatarkin, 2012, p. 30).

It should be noted that the dynamics of the city proper development should be similar to that of the suburbs. The city proper growth ratio exceeding those of the suburbs indicates that it draws the resources in. Under such conditions, it is impossible to speak about the effective sprawling and functioning as urban agglomeration since it does not promote the improvement of suburbs' qualitative characteristics.

2. Literature Review

As a basic research XIX-XX centuries, devoted to the study of the agglomeration process, highlight the work of W. Isard, A. Weber, W. Christaller, W. Launhardt, L. Lefebvre, J. Tyunen.

Modern researches are of special interest. So, Krugman (1991) identified a pattern of occurrence of regional agglomeration. In his view, this contributes to increasing the effect of market size or access to it. Faini (1984) describes the model economy of the two regions. According to the theory of increasing returns author in the service sector leads to substantial differences in the growth regions. According to the model of 'core-periphery', Myrdal (1957) as well as Gilbert and Gugler (1982) development of the region associated with random factors. The cause of the uneven development of regions is increasing returns to scale. Pred (1966) describes the basic model of regional income multiplier. The author notes that if the economy of the region will reach a large scale, it will enter a period of cumulative growth. The considerable volume of demand in the region will make favorable production of the new (earlier not made) goods. This will increase the multiplier of the export base of the region. The traditional model of modernization theory to accommodate the production of Fujita et al. (1999) assumes that all labor is mobile and location of agricultural production depends on internal causes. According to Romer (1992), the emergence of agglomerations is a random phenomenon. A major factor in the formation of agglomerations is the accumulation of industrial activity in certain regions. The cause of the uneven development of regions is the concentration of production activities in a particular area. Theory of stochastic growth Ellison and Glaser (1997) is an alternative explanation of the emergence of agglomerations. The emergence of agglomerations associated with random phenomena that give rise to the economic growth in certain regions.

Estimation of parameters of development of the city allowing to compare the cities with each other and study the dynamics of the indicators are presented in the works of Hiremath et al. (2013), Zenker et al. (2011), Shearmur (2012), Prado-Lorenzo et al. (2010).

In Russia works of many authors, among which E.G. Animitsa, R.V. Babun, V.G. Glushkova, B.M. Grinchel, I.N. Zaslavsky, I.A. Ilyin, G.M. Lappo, V.Y. Lyubovny, Z.Z. Mullagaleeva, N.N. Naymark, T.G. Nefedova, A.A. Neshchadin, P.A. Orekhovskiy, E.N. Pertsik, N.V. Petrov, P.M. Polyan, O.S. Pchelintsev, I.V. Starodubrovskaya, V.V. Yanovsky, etc. are devoted to studying of agglomerative processes.

However, despite the significant contribution of researchers, many theoretical, methodological, methodical and practical aspects of the dynamics of agglomerative processes in Russia are not rather investigated.

3. Research Methodology

Among the modern researches of agglomeration processes, the particular interest is caused by the works devoted to measurement of the dynamics of agglomeration processes. Grinchel and Antonova (2012) suggest using the mark and generalized assessment on 16 indicators relevant criteria agglomeration development. The authors note that "the proposed approach allows to measure the dynamics of regional agglomeration process, a fixed period of its decline, growth, to understand its specifics in each region" (Grinchel & Antonova, 2012, p. 83).

Kolchinskaya (2014) describes a method for studying the dynamics of a particular city by calculating the summary measure of the city, including the assessment of the various areas of city life. Research is conducted on fifteen largest cities of Russia. The author notes that "to assess the dynamics of the city it is advisable to use three groups of indicators: population characteristics, economic indicators and living conditions. For each group calculated a general indicator. This allows us to estimate due to the scope of what the city is leading or, conversely, loses on the level of development in comparison with other cities" (Kolchinskaya, 2014, p. 203).

An important focus for analysis of the dynamics of the agglomeration process is the study of the consistency of the rate of agglomeration development. According to the authors of the present study, to assess the dynamics of the indicators over time it is reasonable to use the average annual growth rate. It is necessary to compare values of growth rates of indicators of the city proper and the suburbs of agglomeration. Dynamics of development of the city proper and

the suburbs should be similar. The development of agglomeration can be considered unbalanced if the growth rate of the city proper exceed the growth rate of the suburbs and is above the national average (assuming that the growth rate is the suburbs do not exceed values than the national average) (Volchkova & Minayev, 2014). Objective assessment of the dynamics of the agglomeration process will determine the future direction of development of the agglomeration.

4. Case analysis

4.1 Case analysis methods

To estimate the dynamics of Novosibirsk and its suburbs agglomeration, the mid-year growth of indicators was used which is defined by the equation below:

$$\overline{G} = C_g \times 100\% , \tag{1}$$

where \overline{C}_g is mid-year growth factor. From here:

$$\overline{C}_g = \sqrt[m]{c_{g1} \times c_{g2} \times c_{g3} \times \dots \times c_{gm}} , \tag{2}$$

where C_g is mid-year growth factor; m is the number of growth factors.

$$c_n = \frac{y_n}{y_{n-1}} , \tag{3}$$

where y is indicator value; n is fiscal year.

The indicators were selected based on the statistical base available which allows calculating the dynamics over the series of years (Gross Regional Product (GRP), average income; migration gain ratio per 10000 persons; housing commissioning; fixed investments; total profit of enterprises; fixed assets) (Volchkova, 2013a).

In creating the regression models, the Gross Regional Product (GRP) was used as a resultant factor. The following indicators were defined as contributors: average income; migration gain ratio per 10000 persons; housing commissioning; fixed investments; total profit of enterprises; fixed assets.

4.2 Growth ratio analysis

Novosibirsk's urban agglomeration is the largest polycentric agglomeration of Siberian Federal District should be considered. Novosibirsk's city proper forms such municipal entities as Novosibirsk, Berdsk, Iskitim, Ob, Krasnoobsk, and Koltsovo. The urban agglomeration of Novosibirsk is the largest in Siberia with population of about 1.9 mn people that came to about 1.2% of the whole population of Russia in 2010. 82.5% of agglomerated population falls to the share of the central place. Table 1 and 2 present socioeconomic indicators of central part of Novosibirsk's urban agglomeration and of Novosibirsk suburbs.

Table 1. Socioeconomic indicators of central part of Novosibirsk's urban agglomeration

Indicators	2007	2008	2009	2010	2011	2012	2013	$\overline{T}_p, \%$
GRP, RUB billion	274.15	291.2	302.4	321.34	337.45	467.8	530.9	111.64
Average income (monthly), RUB	14015.2	18369.3	19593.2	23374.9	24909	25628	27817	112.10
Migration gain ratio, persons	25	64	89	71	112	152	138	132.94
Housing commissioning, thous.m ²	918.40	1026.7	814	1017.00	1029.8	1114.8	1179.6	104.26
Fixed investments, RUB billion	56.98	78.79	58.34	67.90	69.70	81.65	102.7	110.32
Total profit, RUB billion	20.9	33.9	35.43	32.7	26.8	31.6	33.9	108.39
Fixed assets, RUB billion	178.9	210.4	225.6	223.8	226.8	267.8	279.9	107.75

Source: based on the data of the Federal State Statistics Service (2015)

Table 2. Socioeconomic indicators of Novosibirsk suburbs

Indicators	2007	2008	2009	2010	2011	2012	2013	$\overline{T_p, \%}$
GRP, RUB billion	91.381	162.374	123	162.801	261.113	191.743	149.75	108.58
Average income (monthly), RUB	10.317	13.08	15.059	16.276	18.244	20.637	22.184	113.61
Migration gain ratio, persons	14	36	49	37	56	58	60.7	127.70
Housing commissioning, thous.m ²	312.2	364.6	398.3	317.3	445.6	462.1	551.9	109.96
Fixed investments, RUB billion	28.22	43.61	43.06	38.9	72.37	18.861	15.074	90.08
Total profit, RUB billion	14.129	13.282	0.036	8.245	26.18	29.067	21.887	107.57
Fixed assets, RUB billion	119.579	163.77	184.994	175.04	184.061	174.806	217.641	110.50

Source: Federal State Statistics Service (2015)

The mid-year growth of central part and the suburbs indicators are presented in Figure 1.

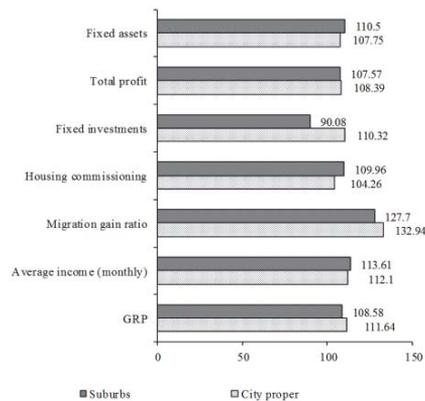


Figure 1. Mid-year growth ratio of central part and the suburbs

By comparison average annual growth rates of socioeconomic indicators show excess growth indicators the suburbs above the growth rate of similar indicators the city proper in three of the seven criteria (average income; housing commissioning; fixed assets).

The development of the Novosibirsk agglomeration can be considered balanced because only one indicator of the growth of the city proper exceeds the growth rate of similar indicators the suburbs (fixed investments) and is above the national average (despite the fact that the growth rate is the suburbs do not exceed values than the national average).

4.3 Correlation analysis

Below presented are the socioeconomic development factors affecting the GRP of the central part and the suburbs of the urban agglomeration of Novosibirsk. Table 3 presents the calculation results of correlation between all the factors.

Table 3. GRP and socioeconomic development correlation model for Novosibirsk's urban agglomeration

	City proper	Suburbs
GRP/Average income	0.8194	0.5326
GRP/Migration gain ratio	0.8584	0.6180
GRP/Housing commissioning, thous.m ²	0.8077	0.3829
GRP/Fixed investments	0.8677	0.5831
GRP/Total profit	0.3297	0.6242
GRP/Fixed assets	0.9373	0.4103

As shown by the correlation analysis in models based from GRP of the average income, migration gain ratio, housing commissioning, fixed investments, fixed assets in the city proper there is a high straight, and the suburbs - the average direct dependencies. The average strength of relationship between indicators identified in the models according to the GRP of the total profit of enterprises.

Thus, the most important indicators for the development of the Novosibirsk agglomeration are average income, migration gain ratio, housing commissioning, fixed investments, fixed assets. However, the growth rate of indicators such as the migration gain ratio, fixed investments is higher in the city proper which, in the opinion of the authors, not had a positive impact on the balanced development of the agglomeration.

5. Findings and Discussion

Thus, the sampling analysis of the annual average growth rate of socioeconomic development in Novosibirsk's urban agglomeration has shown that the suburbs growth ratio exceeds that of the city proper by three indicators. Benchmarking of these indicators has demonstrated the similar growth ratio of the city proper and the suburbs practically in all parameters investigated.

As the correlation analysis has shown, that the GRP volume is in high dependence with the average income, migration gain ratio, housing commissioning, fixed investments and fixed assets. Actually, increasing these indicators it is possible to achieve the economic growth of the urban agglomeration. This allows drawing a conclusion about the favorable effect of the urban agglomeration of Novosibirsk in relation to its suburbs, and the improvement of its qualitative characteristics. Thus, this territory is considered to be a favourable for further development of urban agglomeration processes.

Evaluating the main directions of development of the Novosibirsk agglomeration is useful to distinguish: improving the quality of life of the population of the suburbs, the formation of transport infrastructure, enhancement of industrial and scientific and educational potential, creation of the balanced labor market, tourism development.

6. Conclusions Remarks

Thus, the main difficulty in the study of social and economic development of agglomerations is the absence to date of a unified statistical framework. Agglomeration are not subject to statistical studies in Russia. No legally enshrined the concept of "agglomeration". Existing methods for the study of agglomerations do not take into account modern trends of the agglomeration process. Typically, they are based on expert judgement and are descriptive in nature. Methodological base of research requires significant revision. In this regard, to create the possibility of a comprehensive study of the agglomeration process, it is necessary to legislate the concept of agglomeration (to amend the town planning code of the Russian Federation regarding the establishment and development of agglomerations), to build a state system of legal support of the functioning processes of agglomeration, to create a unified methodological basis for developing strategies for social and economic development of agglomerations (Volchkova, 2013b).

Of particular importance in the analysis of the agglomeration process should be given to the harmonization of social and economic development of settlements within the Metropolitan area. The solution to this problem would facilitate the convergence of levels of social and economic development of settlements, will reduce the level of inequality between the settlements, and improve the stability of the economic, social and infrastructure areas of the agglomeration. Objective assessment of the dynamics of the agglomeration process will determine the future direction of development of the agglomeration. However, a major difficulty of these studies is the lack of statistical information and a unified methodological approach to the analysis of the agglomeration process. Nevertheless, the interest in the measurement of the agglomeration process exists.

References

- Ellison, G., & Glaser, E. (1997). Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach. *Journal of Political Economy*, 105, 889–927.
- Faini, R. (1984). Increasing returns, non-traded inputs and regional development. *Economic Journal*, 94, 308–323.
- Federal State Statistics Service (2015). Regions of Russia. Main socio-economic indexes of the cities. [Online] Available: <http://www.gks.ru> (February 02, 2015).
- Fujita, M., Krugman, P., & Venables, A. J. (1999). *The Spatial Economy: Cities, Regions, and International Trade*. MIT Press.
- Gilbert, A., & Gugler, J. (1982). *Cities, Poverty and Development: Urbanization in the third world*. Oxford: Oxford University Press.
- Grinchel, B. M., & Antonova A. A. (2012). Measurement of dynamics of agglomerative processes in regional economy. *Economic and*

- social changes: the facts, tendencies, the forecast, 5, 79–90.
- Hiremath, R. B., Balachandra, P., Kumar, B., Bansode, S., & Murali, J. Indicator-based urban sustainability – a review. *Energy Sustain. Dev.*, 17, 555–563.
- Kolchinskay, E. E. (2014). *Composite index of development of the city*. Proceedings of the IV International scientific-practical conference "Strategic planning for cities and regions", Togliatti State University, Togliatti.
- Krugman, P. (1991). Increasing Returns and Economic Geography. *Journal of Political Economy*, 99, 483–499.
- Lappo, G. M. (2007). Urban agglomerations of the USSR-Russia: features of dynamics in the 20th century. Convenient space for the city. *SPb. Russian expert review*, 4–5.
- Myrdal, G. (1957). *Economic theory and underdeveloped regions*. London: Duckworth.
- Prado-Lorenzo, J. M., García-Sánchez, I. M., & Cuadrado-Ballesteros, B. (2012). Sustainable Cities: Do Political Factors Determine the Quality of Life? *Journal of Cleaner Production*, 21 (1), 34–44.
- Pred, A. R. (1966). *The Spatial Dynamics of U.S. Urban-Industrial Growth, 1800-1914: Interpretive and Theoretical Essays*. Cambridge, MA: MIT Press.
- Romer, P. M. (1991). Increasing returns and new developments in the theory of growth. In W.A. Barnett, B. Cornet & C. d'Aspremont (eds). *Equilibrium Theory and Applications* (pp. 83–110). Cambridge: Cambridge University Press.
- Shearmur, R. (2012). Are cities the font of innovation? A critical review of the literature on cities and innovation. *Cities*, 29, 9–18.
- Tatarin, A. I. (2012). Development of economic space of regions of Russia on the basis of the cluster principles. *Economic and social changes: facts, tendencies, forecast*, 3 (21), 28–36.
- Volchkova, I. V. (2013a). Development of the system of indicators of social and economic development of city agglomeration. *The Scientific and practical interindustry magazine "Integral"*, 4 (72).
- Volchkova, I. V. (2013b). Theoretical and practical approaches to research of processes of formation of city agglomerations. *Regional economy: the theory and practice*, 29 (308), 36–46.
- Volchkova, I. V., Minayev, N. N. (2014). *Theory and practice of management of development of agglomerations*. Tomsk: Publishing house TSUAB.
- Zenker, S., Petersen, S., & Aholt, A. (2009). Development and implementation of the citizen satisfaction index (CSI): four basic factors of citizens' satisfaction. *Research Papers on Marketing and Retailing*, 39, 1–19.