Nadezhda Baksha, Ph.D. in Economics, Associate Professor
Dmitry Vakorin, Ph.D. in Economics, Associate Professor
Tatyana Sharapova, Master of Economics, Senior lecturer
Tyumen State University, Russia

https://doi.org/10.26366/PTE.ZG.2018.133

Ratings of innovative developments as indicators of developmental problems in the region

Abstract

This research aims at identifying economic problems within regional policy of innovation. In this case, rating procedure is employed as a methodological tool to indicate strategic errors, generated by administrative decisions in the field of innovation. The researchers come up with a hypothesis that ratings can serve as indicators of regional innovative development pointing out problematic areas, yet ratings are not fully taken into account while adjusting regional innovation strategy. The authors apply the Tyumen region statistical data to test the presented approach. For example, rating markers are used as innovative development indicators (a technique offered by National Research University "Higher School of Economics" and A.B. Gusev's method). The results show that, despite the positive dynamics of the Tyumen region general rating, certain innovative development problems still remain.

Key words: innovative development scenario, rating, innovative development indicator, index of innovative development.

JEL CODE: 012, 031.

Ratingi rozwoju innowacyjnego jako wskaźniki problemów rozwojowych w regionie

Abstrakt

Celem badania jest identyfikacja problemów gospodarczych w ramach regionalnej polityki innowacji. W tym przypadku procedura ratingowa jest wykorzystywana jako narzędzie metodologiczne do wskazywania błędów strategicznych generowanych decyzjami administracyjnymi w dziedzinie innowacji. Badacze wysuwają hipotezę, że ratingi mogą służyć jako wskaźniki regionalnego innowacyjnego rozwoju, wskazując obszary problematyczne; jednak nie są one w pełni brane pod uwagę przy dostosowywaniu regionalnej strategii innowacji. Autorzy wykorzystują dane statystyczne regionu Tiumeń, aby przetestować analizowane podejście. Przykładowo znaczniki oceny są wykorzystywane jako innowacyjne wskaźniki rozwoju (technika oferowana przez National Research University „Wyższa Szkoła Ekonomii" i metoda A.B. Guseva). Wyniki pokazują, że pomimo

pozytywnej dynamiki ogólnego ratingu regionu Tiumeń, nadal istnieją niektóre problemy innowacyjnego rozwoju.
Słowa klucze: scenariusz innowacyjnego rozwoju, rating, wskaźnik innowacyjnego rozwoju, indeks innowacyjnego rozwoju.

Introduction

Rating procedure is considered to be one of the most popular approaches to define innovation activity indicators, innovative susceptibility, and innovative development in a region. Rating indexes are different, yet there is a set of stable major indicators. Employing rating components, this research aims to deepen the understanding of specific economic problems, that affect the innovative development, and to identify strategic errors, generated by administrative decisions in the field of innovation. As a research hypothesis, it was suggested, that ratings, which serve as the indicators of regional innovative development, make it possible to identify developmental problem areas, yet they are not taken into account while adjusting administrative decisions on the regional innovation strategy. It should be noted that a change in one of rating components causes a change of other components. This dependence justifies, that in the context of innovative development, it is wrong not to take into account the phenomenon of rating.

New gained knowledge is limited to the scope of innovative development problems in the region. It is of interest to the subjects of public administration and investors. This article deals with the theoretical aspects of using rating in different countries, and the rating's formation methodological tools based on Rosstat, EBSCO Information Services, and other databases. A retrospective analysis, which was carried out in order to identify problematic aspects of the innovative development scenario realization, was based on the dynamics of the main rating components and indicators.

Theoretical aspects of sustainable development in innovative conditions

The specifics of human development in the era of scientific and technological progress are reflected in the reports of a scientific group working with the support of the Club of Rome: J. Forrester (1971), D. Meadows (1972), D. Gabor (1981), also researches of the Russian scientists B. Koptyug (1992), V. Matrosov (1993). In 1987, the International Commission on the Environment determined that sustainable social development leads to the satisfaction of the current social needs without reducing the future generations' ability to meet their needs

(The new paradigm…, 2000, p. 218). At the same time, sustainable social development is interpreted as a proclamation of the necessity to preserve the fixed capital including: capital created by man, human capital, and natural capital A. Golub, E. Strukov (2010, p. 345). Therefore, the innovative economic development cannot occur without human knowledge and modern technologies. The changes in the research paradigm of regional economic security are closely affected by innovations. This idea is reflected in the works of W. Schwerdtner, R .Siebert, M. Busse (2015, pp. 2301-2321); S. Grobbelaar, G. Nigel & A. Brent (2016, pp. 233-246); B. Ziolkowski (2015, pp. 1188-1197); A. Barska, J.Jędrzejczak-Gas, J. Wyrwa (2017, pp. 57-69) and M. Fic at al. (2005). A. Sukhovey (2014, pp. 141-150) considers the problems of providing innovative security in Russia. E. Skawinska (2014) does a research on the barriers for the reduction of industrial innovative potential, studying the cooperation between enterprises and the scientific sector. J. Kazmierczyk and M. Aptacy (2016) dwell on the value of innovation in business management.

The most difficult task in sustainable systems' concepts is the choice of evaluation parameters for economic systems' conditions based on the strategies of innovation development. This aspect is observed in the works of M. Rajahonka, T. Pienonen, R. Kuusisto (2015, pp. 52-62); M. Miosga, S. Hafner (2014). Such researchers as O. Lavrinenko, N. Jefimovs, J. Teivāns-Treinovskis (2017) address the issues in the area of secure development as an innovative system's economic growth factor for border regions (Latvia-Lithuania-Belarus). Some researchers proposed their own development scenarios. For example, in 2005 a group of authors under the direction of Russian researchers B. Kuzyk and Y. Yakovets (2005) developed the models of the inertial scenario and the innovative pattern of Russian economic development based on the gross domestic product's (GDP) dynamics. These models originated from similar Canadian and Korean development models for the period from 2008 to 2030 and further to 2050. According to N. Kimiltae (2013, pp. 51-76), it should to be noted that Korea's economic growth occurred largely due to the introduction of knowledge economy model and the evaluation of the regional index of knowledge competitiveness (human capital).

Moreover, another significant result of innovative development is the reduction in regional differentiation in terms of the quality of life. In regard to this, it is necessary to observe regional development experience in China. Different approaches to the definition of regional sustainability index (RCI), which includes social, economic, environmental and subject indexes are actively considered by T. Feifei and L. Zhaohua (2015, pp. 29-39). In the sphere

of regional industry, Chinese researchers S. Yinghua, L. Bingsheng, W. Xueqing (2015, pp. 34-47) analyse efficiency indicators within ecological economics. From the innovative point of view, the Portuguese experience is also useful in attracting business community in the innovation process. A large-scale analytical work was done there and the innovation determinants were identified for the past 20 years (Noronha, Vicente 2015, pp. 329-344).

Data and analysis of the techniques of rating's formation

In recent years different foreign methods of regional innovative development evaluation were adapted to Russian conditions, and were systematized by K. Zadumkin and I. Kondakov (2010, pp. 86-100): the knowledge index evaluation based on statistical and specialized information, used by the World Bank (Fedorova, Startsev, Inyuhina 2006); the evaluation of innovative index of EU members based on groups of indicators (European Innovation.., 2004-2014); scientific and technological activity indexes, which determine their clusters (Oslo Manual, 1997); evaluation of the human scientific potential (Canberra Manual, 1995); a common practice for surveying research and experimental development (Frascati Manual, OECD 1995).

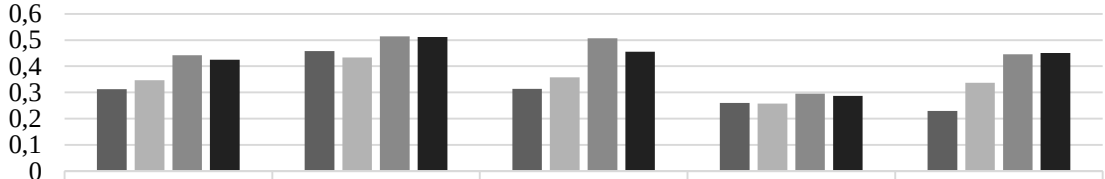
Among the methods implemented by Russian researchers one can find: the structural analysis of the innovation activity of a territory by S. Kortov (2004, pp. 25-33); an assessment of regional innovative activity based on regression analysis by T. Shtertser (2005, pp. 100-109); regional innovation potential analysis based on the groups of factors by E. Amosenok, B. Bazhanov (2006, pp. 134-145); regional innovation system development analysis, based on the indicators that determine their clusters by A. Varshavsky (2005, pp. 201-204); the calculation of innovation index for different regions (Independent Institute…, 2005).

This study is based on the following methods. Firstly, this research employs regions' innovative development rating. The NRU HSE elaboration (2012) includes socio-economic development indicators and organization of innovative activity in a region. Secondly, A. Gusev's method (2013) allows the authors to consider the innovative component of industrial enterprises along with two groups of indicators: 1) labor productivity, capital productivity of production, and ecological production, 2) R&D costs per employee; the costs of technological innovations per employee; release of innovative products per capita.

The Tyumen region is a donor region. It has high natural resources potential and a relatively stable socio-economic situation. These factors are important for the integration

into the world economy. Therefore, it can be assumed that the innovative activity in the region should be higher than the average level in Russia (Fig. 1, 2).

Fig. 1.The Indexes of Innovative Development in the Tyumen region

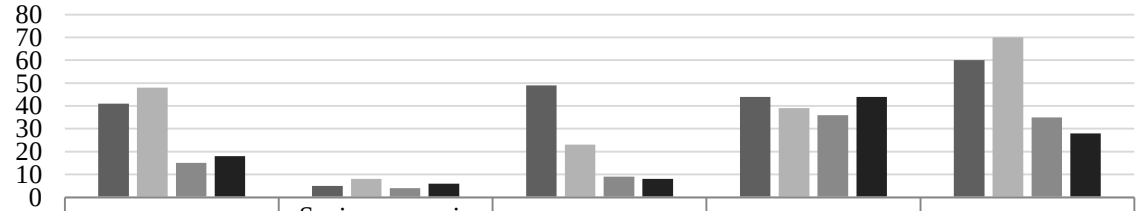


	Russian Regional Innovation Index (consolidated)	Socio-economic conditions of innovative activity	Scientific and technical potential	Innovation activity	The quality of innovation policy
2008	0,313	0,458	0,314	0,26	0,23
2010	0,347	0,434	0,358	0,258	0,337
2012	0,442	0,514	0,507	0,296	0,446
2013	0,425	0,512	0,456	0,287	0,45

Source: compiled by the authors (Analytical Reports…, 2008-2013).

Despite the presence of favorable socio-economic conditions, scientific and technical potential, the rank of the "Innovation activity" sub-index did not change and it remained at a low level. However, the value of the consolidated Russian Regional Innovation Index is close to the average, which creates a false impression of the development of innovative activities.

Fig. 2. The Status of the Tyumen region among the subjects of the Russian Federation



	Russian Regional Innovation Index (consolidated)	Socio-economic conditions of innovative activity	Scientific and technical potential	Innovation activity	The quality of innovation policy
2008	41	5	49	44	60
2010	48	8	23	39	70
2012	15	4	9	36	35
2013	18	6	8	44	28

Source: compiled by the authors (Analytical Reports…, 2008-2013).

According to AIRR (2017), in the rating of innovative regions of Russia the Tyumen region downgraded 5 positions in the general rating, and the sub-rating of innovative development decreased from 18 in 2013 to 34 in 2015. Thus, due to the fact, that the Russian Regional Innovation Index is calculated from the four indicators, the overall change dynamics

is positive, but the Innovation Activity Index did not change. It shows low motivation of the regional administration and business community to innovation, and the lack of innovation in business activity.

Results

To test the research results, a retrospective analysis of the Tyumen region innovative development was carried out. The HSE rating results allowed the authors to identify the range of the normalized indicators' values: negative dynamics, zero and low values (it's limited to the interval from 0 in the region with the minimum value index to 1 in the region with the maximum value) (Table 1, 2).

Table 1. The range of the normalized indicators' values (Negative dynamics, low and zero values)

Indicator	2008	2010	2012	2013
The proportion of employees in R&D in average annual number of employed in the region's economy	0,197	0,222	0,192	0,192
The intensity of costs on technological innovation (in industrial organizations)	0,037	0,006	0,212	0,252
The proportion of resources of the Russian Federation subject budgets and local budgets in overall costs on technological innovation	0,015	0,007	0,007	0,046

Source: compiled by the authors (*Analytical Reports*…, 2012-2014).

In the selective analysis of the components of the innovative development index (see Fig. 3) it may be noted that important indicators have quite low values. If we look at the rating components (see Table 2), we can see the same result and the percentage decreases on the selected indicators.

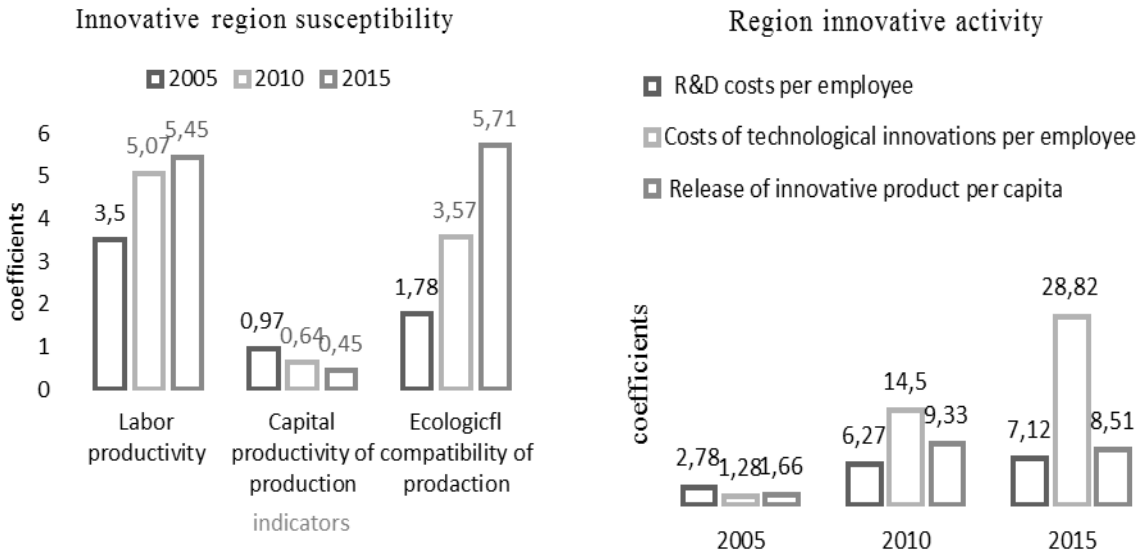
Table 2. The values of indicators for the Tyumen region (without districts)

Indicator, %	2012	2013	2014
The proportion of employment in high- and medium-technological sectors of the high level in industrial production in the total number of employed in the region's economy	2,4	2,3	2,2
The proportion of organizations, which carry out technological innovation in the total number of organizations (among industrial organizations)	10,4	9,8	8,2
The intensity of costs on technological innovation (among industrial organizations)	15,8	25,3	4,3

Source: compiled by the authors (*Analytical Reports…*, 2008-2013).

According to the rating of innovative regions of Russia AIRR (2017), the trend to decrease for most problematic indicators remained in 2015-2016 as well. A retrospective analysis of the indicators' dynamics used in A. Gusev's method allowed identifying problem indicators, which makes it possible to adjust the region's innovation policy to enhance innovation and innovative activity attractiveness. The current situation is as follows (see Fig. 3).

Figure 3. Innovative Susceptibility and Innovative Activity of the Region (2000-2015)



Source: authors' calculations, based on Tyumen statistical service data (2000-2015).

The indicators considered in the research for the period of 2000-2015 reveal that the ecological compatibility of production is rising in the region (quotient of the GRP subject to the volume of harmful emissions into the atmosphere, originating from stationary sources). Yet, the labor productivity rose only by 1.56 times over 15 years (GRP ratio subject to the annual average number of people employed in the regional economy); and the capital productivity of production decreased by 2.16 times (GRP ratio subject to value of fixed assets). The indicators (comparing with the base period (2000)) are not optimistic. The investments in the production sector did not yield the desired return productivity in the studied period. The considered indicators' growth rate tends to be unstable and decreases, with some exceptions.

Conclusion

The obtained results confirmed the proposed hypothesis that regional innovative development ratings identify developmental problem areas, but they are not fully taken into account in administration decisions while adjusting the regional innovation strategy. To avoid strategic errors, it is necessary to:

1) define the priority areas of territorial planning in innovative development, including investment in technological innovation;

2) increase the expenditure intensity on technological innovation (there was a tripled reduction for industrial organizations);

3) increase the motivation of regional administration and business community to innovative business activity (Innovation Activity Index in 5 years did not change);

4) create innovative environment for organizations implementing technological innovation (industrial production decreased by 12%).

Moreover according to AIRR (2017), in the rating of innovative regions of Russia the Tyumen region downgraded 5 positions in the general rating, and the sub-rating of innovative development decreased from 18 in 2013 to 34 in 2015.

As a result, even in the regions with sufficiently favorable socio-economic conditions, there is a lack of effective innovative activities' strategy, innovative motivation, and interest of business community in innovation.

The work is executed at financial support of the Russian Humanitarian Scientific Fund, project No 16-03-00500, Tyumen State University.

References

Amosenok E., Bazhanov A. (2006), *Integral Assessment of the Innovation Potential of Russian regions,* "Region: Economics and Sociology", vol. 2, pp. 134-145.

Analytical Reports' ratings of innovative development of the Russian Federation (2012, 2013, 2014*).* NIU HSE, Moscow.

Anderson A. M. (1984), *Science and Technology in Japan,* Longman, Harlow.

Barska A., Jędrzejczak-Gas J., Wyrwa J. (2017), *Innovative activity of the enterprises in the service sector in Poland*, in: *Central European Conference in Finance and Economics - CEFE 2017, Technical University of Košice*, pp. 57-69.

Canberra Manual (1995), *The Measurement of Human Resources Devoted to Science and Technology*, OECD, Paris, available at: http://www.oecd-ilibrary.org/science-and-technology/the-measurement-of-scientific-and-technological-activities_19900414 (1.11.2016).

European Innovation Scoreboard (2003), available at: http://www.proinno-europe.eu/extranet/admin/uploaded_documents/innovation_scoreboard (15.02.2016).

European Innovation Scoreboard (2013), available at: http://www.trendchard.org (10.02.2016).

Fedorova I., Startseva Yu., Inyukhina E. (2006), *Components of "economy of knowledge"*, "EKO". No. 12, pp. 59-66.

Feifei T., Zhaohua L. (2015), *Interaction Characteristics and Development Pattern of Sustainability System in BHR (Bohai Rim) and YRD (Yangtze River) regions, China*, "Journal Ecological Informatics", Vol. 30, pp. 29-39, DOI: 10.1016/j.ecoinf. 2015.09.008.

Fic M., Graczyk M., Stankiewicz J., Wyrwa J., Jędrzejczak-Gas J., Wysocki R. (eds.) (2005), *Lubuskie Regional Innovation Strategy: diagnosis structure system*, Zielona Góra.

Forrester J. (1971), *World Dinamics*, Wright-Allen Press, Cambridge.

OECD (2002), *Frascati Manual 2002, Proposed Standard Practice for Surveys on Research and Experimental Development*, available at: http://www.tubitak.gov.tr/tubitak_content_files/BTYPD/kilavuzlar/Frascati.pdf (1.11.2016).

Gabor D., Colombo U., King A., Galli R. (1981), *Beyond the Age of Waste. A Report to the Club of Rome*, Pergamon Press, Oxford – New York, available at: http://trove.nla.gov.au/work/10262140?selectedversion=NBD1897037 (1.11.2016).

Golub A., Strukov E. (2010), *Economics of Natural Resources*, Aspect-press, Moscow.

Grobbelaar S., Nigel G-E., Brent A. (2016), *From Enterprise Development to Inclusive Innovation – A Systemic Instruments Framework for Regional Innovation Support*, "African Journal of Science, Technology, Innovation and Development", vol. 8, pp. 233-246, https://doi.org/10.1080/20421338.2016.1159401.

Gusev A. (2013), *Forming of the Ratings of Innovative Development of Russia's Regions and Recommendations to Stimulate Innovative Activity of the Russian Federation*. Available at: http://kapital-rus.ru/articles/article/rejting_regionov_rossii_po_urovnyu_innovacionnogo_razvitiya/(date of access: 15.07.2016).

Independent Institute for Social Policy. Social Atlas of Russian Regions. Integral index: the index of innovation, available at: http://rethinkingrussia.ru/en/wp-content/uploads/2016/03/Think-Tank-Atlas.pdf (25.01.2016).

Kazmierczyk J., Aptacy M. (2016), *Management of the Purposes in Banks: Polish case*. "Business and Problems of Stability", vol. 4 (2). pp. 146-158.

Kimiltae N. (2013), *A Study on Measurement of Regional Knowledge Competitiveness Index in Korea: Using World Knowledge Competitiveness Index.* "Journal of Economics Studies", vol. 31, pp. 51-76.

Koptug V. (1992), *Conference of the UN on the Environment and Development.* Rio de Janeiro. Information review. Novosibirsk, available at: http://www.prometeus.nsc.ru/koptyug/works/w1992.ssi (15.06.2015).

Kortov C. (2004), *Analysis of Innovative Development of the Territory on the Basis of the Evolutionary Approach*, "Innovation", vol. 6, pp. 25-33.

Kuzyk B., Yakovets Y. (2005), *Russia – 2050: Strategy of Innovative Breakthrough*. Economics, Moscow, available at: https: http://misk.inesnet.ru/2005/03/russia-2050-strategy-of-innovative-break-through (15.06.2015).

Lavrinenko, O., Jefimovs N., Teivāns-Treinovskis J. (2017), *Issues in the Area of Secure Development: Trust as an Innovative System's Economic Growth Factor of Border Regions (Latvia-Lithuania-Belarus)*, "Journal of Security and Sustainability Issues" 6(3): pp. 435-444, http://dx.doi.org/10.9770/jssi. 2017.6.3(9).

Matrosov V. (1993), *Analysis of Development Instability on the Base of Mathematical Modeling. Preprints of Second Intern. Workshop*, The Russian Academy of Sciences, Moscow.

Meadows D., Meadows D., Randers J., Behrens III.W. (1975), *The Limits to Growth. A Report for the Club of Rome's Project on the Predicament of Mankind*, Potomac Associates Book, New York.

Miosga M., Hafner S. (2014), *Regional Development in the Sign of the Big Transformation. Strategies for Resource Efficiency, Demographic Change and Innovation Ability*, Oekom publishing company, Munich, DOI: 10.1007s13147-015-0349-4.

Schwerdtner W., Siebert R., Busse M., Freisinger U. (2015), *Regional Open Innovation Roadmapping: A New Framework for Innovation-Based Regional Development*. "Sustanability", vol. 7, pp. 2301-2321.

OECD (1997), *Oslo Manual: The Measurement of Scientific and Technological Activity*, OECD Publishing, Paris, available at: http://www.oecd-ilibrary.org/science-and-technology/the-measurement-of-scientific-and-technological-activities_19900414 (1.11.2016).

Rajahonka M., Pienonen T., Kuusisto R., Handelberg Y. (2015), *Orchestrators of Innovation-Driven Regional Development: Experiences from the INNOFOKUS Project and Change 2020 Programme*, "Technology Innovation Management Review", vol. 5(10), pp. 52-62.

Shtertser T. (2005), *Empirical Analysis of the Factors of Innovation Activity in the Regions of Russia*, "*Vestnik NGU*", vol. 2, pp. 100-109.

Rating of Innovative Regions of Russia (2017), Version 2016, available at: http://www.i-regions.org/images/files/presentations/AIRR_26.12.pdf (date of access: 1.05.2017).

Sukhovey A. (2014), *The Problems of Providing Innovative Security In Russia.* "The Economy of the Region", vol. 4, pp. 141-150.

Skawinska E. (2014), *Innovativity of Enterprises – Barriers and Means of their Decrease (example of Wielkopolska Region),* "Scientific Journal of Polish Economic Society in Zielona Gora", vol. 1, pp. 6-17.

The Global Competitiveness Report 2015-2016 (2015). World Economic Forum, available at: http://www3.weforum.org/docs/gcr/2015-2016/Global_Competitiveness_Report_2015-2016.pdf (20.05.2016).

Matrosov V., Levashov V. Demyanko U. (2000), *Problems of global security and a new paradigm of sustainable development of civilization*, in: Koptyug V., Matrosov V., Levashov V. Koptyug V. (ed.), *The New Paradigm of Development of Russia in XXI century*, Akademia, Moscow, available at: http://www.prometeus.nsc.ru/koptyug/ideas/paradigm/ (10.01.2016).

The science. Innovation. The Information Society (2015), Short Statistical Book. Mr. Abdrakhmanov N., Gorodnikova L. "Hochberg et al. Higher School of Economics", Moscow, HSE, vailable at: https://www.hse.ru/en/org/projects/211257385 (15.02.2016).

Tyumen Statistics (2015), available at: http://tumstat.gks.ru (11.04.2016).

Varshavsky A. (2005), *An Innovative Way of Development for the New Russia*, in: V.P. Goregliad (ed.), Innovativer Entwicklungspfad für das neue Russland, Nauka, Moscow, pp. 201-204.

Noronha T., Vicente G. (2015), *Innovative Firms Behind the Regions: Analysis of Regional Innovation Performance in Portugal by External Logistic Biplots,* "European Urban and Regional Studies", vol. 22, pp. 329-344.

Yinghua S., Bingsheng L., Xueqing W. (2015), *The Energy Efficiency of China's Regional Construction Industry Based on the Three-Stage DEA Model and the DEA-DA Model*. "Journal of Civil Engineering", vol. 20, pp. 34-47, DOI: 10.1007/s12205–015–0553–3.

Zadumkin K., Kondakov I. (2010), *The Methodology of Comparative Evaluation of the Scientific and Technical Potential of the Region*, "Economic and Social Changes: Facts, Trends, Forecast", vol. 4 (12), pp. 86-100.

Ziolkowski B. (2015), *Regional Development Management in the Context of Axiological Aspects of Regional Innovation Strategies*,[in:] *CERS 2014: 5TH Central European Conference in Regional Science, International Conference Proceedings*, pp. 1188-1197.