

IDENTIFICATION OF PERSPECTIVE RESEARCH AREAS IN THE FIELD OF REGIONAL ECONOMY: RUSSIAN AND FOREIGN EXPERIENCE

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Abstract. *Identifying promising areas of research in different fields of knowledge is a very important factor that contributes to increasing the level of scientific development in modern conditions among a large information flow. Special attention will be paid to studies of regional economy because it created conditions for the development factors of the infrastructure of knowledge-based economy that include human capital, public institutions, which provide a high quality of life, education, fundamental science etc. Researches in the field of regional development have a long tradition and since the 2008s this field has grown significantly. The purpose of this article is the identification of advanced research in the field of the regional development on the basis of Russian and foreign experience. In this paper, we performed a comparative study in the field of regional development made by Russian scientists and the world scientific community in order to define perspective research fronts. Web of Science and Russian Science Citation Index were used as an information base. We used specific methods for comparative analysis of research fronts that include: (a) Cite Space for the definition and visualization of research fronts, (b) Google maps for visualization the connections of collaboration between scientists and (c) semantic analysis techniques for identifying areas of research in the field of regional economy made by Russian scientists. Our results showed that there are differences between research areas in Russia and other countries that are caused by the fundamentally different level of development. Most Russian studies confine oneself to vague generalities and problems of regional development; regional development factors are studied in them. But since 2008 publications on the development of information society began to emerge. The results of our study can be the basis of forecasting perspective directions of research. However, the methods of this paper require in-depth study and can be used to further improve government support of scientific research in Russia.*

Keywords: *research front; regional economy; bibliometric analysis; science.*

Introduction

The regional economy is a complex subsystem of the country’s national economy causing the growth of research in the field of its development. It is due to the fact that scientific community supports the opinion on the importance of ideas about the regional economy functioning, binding of the regional economic mechanism key elements, power, and orientation of internal and external links of the region, carrying out the integration of regions into a common economic space.

In many respects, the current state and level of regions development are determined by the history of the country, existing tendencies and factors of national economies development. The development factors can be formed both within the country and outside it. At the same time, a considerable part of the factors influencing the regional economy is outside the region. In these conditions, it isn’t enough to consider certain regions without a broad analysis of their interaction with the economy in general. Thus, the complex analysis should research not only the region but also its place in the system of economic relations.

Nowadays, the increase of information flow in all fields of knowledge shows the need for identification of methods and approaches to its structuring, determination of the key research directions that determines the purpose of this study. The purpose of this article is the identification of advanced research in the field of the regional development on the basis of Russian and foreign experience.

Methodology of the study

For identification of the prospective research areas in the field of regional economy development, we have used the methodology presented in Figure 1.

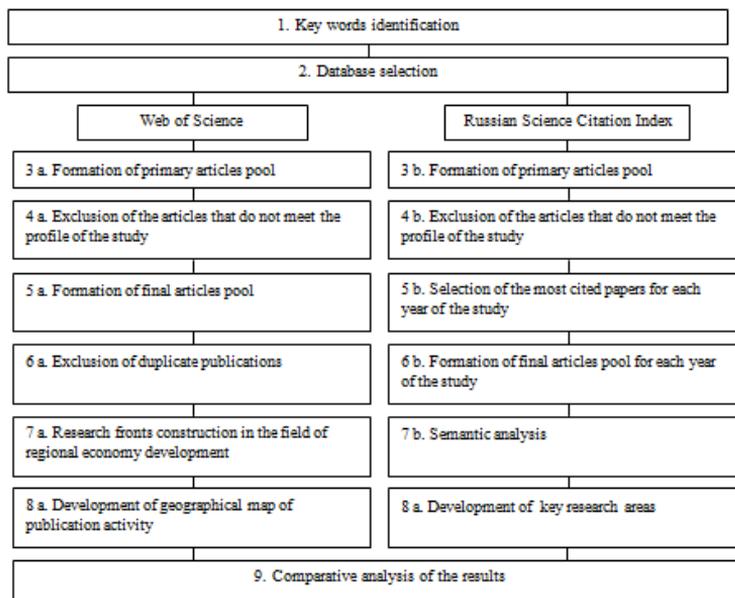


Figure 1. Methodology of the study

At the first stage, keywords identification was carried out to determine the perspective research fronts. "Regional development" and "regional economy" were used as keywords taking into account logical conditions and combinations. These keywords are the most appropriate to reflect the research directions.

At the second stage of the study, the Web of Science and Russian Science Citation Index scientometric databases were selected. It is due to the fact that these scientometric databases are used for the assessment of overall scientists' performance in Russia (President of Russian Federation, 2012). An essential restriction of the Russian Science Citation Index is a lack of possibility to download the received research results that complicate further analysis. The use of various databases has predetermined parallel researching on each database separately.

At the third stage, a primary pool of scientific publications with the use of keywords was created for both chosen scientometric databases. 43,886 scientific publications were received from the Web of Science database and 876,589 publications were received from the Russian Science Citation Index database. As the preliminary analysis of the received publications showed, a number of articles presented in the Web of Science does not correspond to the profile of the research and belong to other scientific areas, such as physics and astronomy. The selection of articles from the Russian Science Citation Index also included the articles, which did not correspond to the scientific profile of the research. Therefore, all articles were checked for compliance with the research profile at the fourth stage, due to which articles were excluded from the received selections.

The difference of databases and possibilities of their analysis predetermined the use of various methods and tools. At the stage 5a, a free product CiteSpace III was used for the analysis of publications received from the Web of Science, which allowed to exclude the duplicate information (Chaomei Chen, 2015). Identification of the perspective directions of these studies in the field of regional economy was carried out by application of bibliographic analysis methods based on the technologies of perspective research fronts determination; this technique is widely presented in foreign scientific publications (Guerrero et al., 2014; Yanhua, Thuminh, Beibei, Wei & Song, 2012; Yanhua, Song, Hongyan & Beibei, 2011). In order to determine of the research fronts, high-rating articles were selected on the basis of the co-citing method (Marshakova-Shaikovich, 2008). The data processing was carried out by means of the CiteSpace software product. For visualization of the obtained information and display of interrelations between scientists, the Google map was used.

For the bibliometric analysis of the Russian Science Citation Index, a semantic analysis of the most significant publications presented to RISC was carried out. For every year of the period from 2006 to 2015, 30 most cited publications were selected. The search was carried out by names, keywords, summaries and bibliography using the information resource, which allows carrying out the semantic analysis. For each studied period, a semantic core was determined on the basis of the most often phrases, which allowed identifying the main directions of researches by Russian scientists. At the last stage, a comparative analysis of the Web of Science and Russian Science Citation Index researches was carried out.

The main restriction of the study is the impossibility of the full analysis for the publications presented in the Russian Science Citation Index. However, these methods allow determining the main distinctive points of research in the area of regional economy development.

The study results

The world scientific community is paying much attention to the problems of regional economy development now. It is possible to state it due to the annually an increasing number of publications (Figure 2).

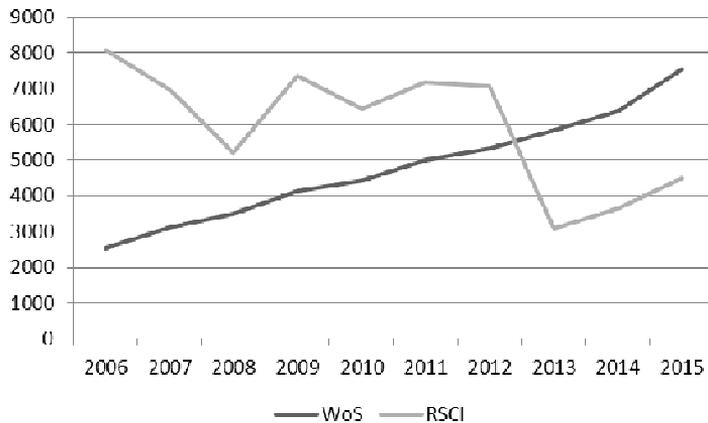


Figure 2. Number of selected publications on the keywords from Web of Science (WoS) and Russian Science Citation Index (RSCI) for the period 2006 - 2015

As one can see in the figure, the number of publications presented in the Web of Science has a positive growth trend regarding the problems of regional economic systems development. The number of publications presented in the Russian Science Citation Index from 2006 to 2012 significantly exceeds the number of publications in the Web of Science. The detailed study of Russian publications in the field of regional economic development shows that the significant excess is due to the duplication of studies published in various journals either with fully matching titles or with partially changed titles, which is unacceptable for the world's leading publishers. The number of publications in the Russian Science Citation Index decreases since 2013 due to attempts of complying with the research results publication ethics. In addition, after the adoption of new criteria for evaluating the performance of academic institutions, it became necessary for Russian scientists to publish their articles in international journals; it explains the growing interest in foreign scientific literature and studies and at the same time the reducing number of publications in the Russian one.

Considerable attention is paid to the regional economy development by scientists all over the world (Figure 3).

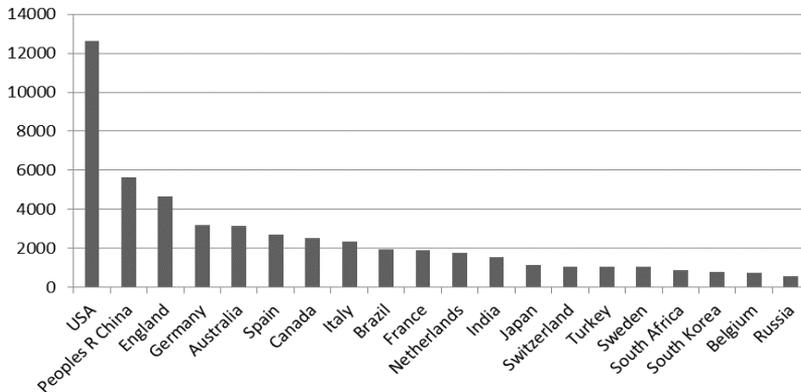


Figure 3. Distribution of publications by country in the Web of Science

As can be seen in the figure, the highest number of publications falls on the United States, approximately 25% of all publications dealing with the problems of regional economic development presented in the Web of Science. The share of Russian publications is just above 1% of all publications.

To identify the promising directions of studying, clustering of publications was carried out for the ones presented in the Web of Science platform using the CiteSpace III software product. For the optimal reflection of data 50 most cited publications of each year were selected, they formed a network of co-citation in the sphere of regional development (see Figure 4).

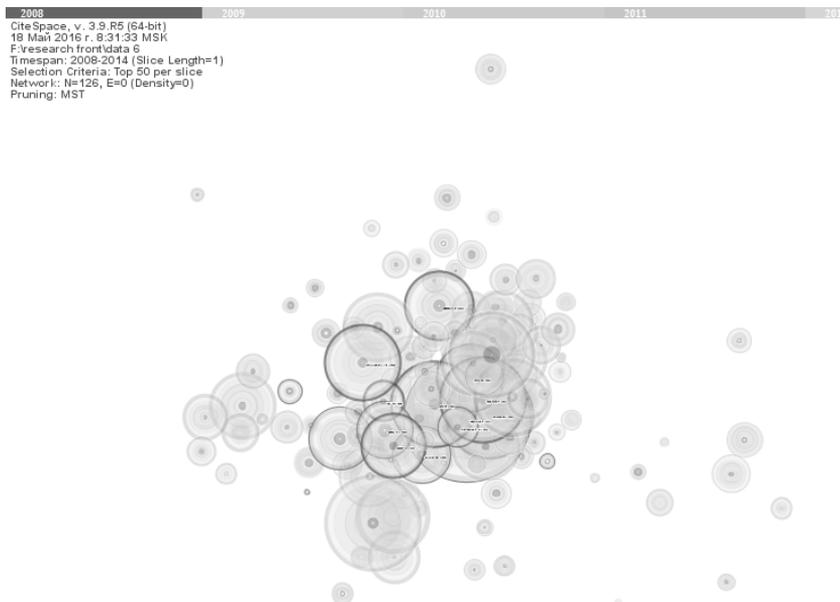


Figure 4. Co-citation network of publications in the field of regional development

Each node represents a scientific work (published article). The color in the node center represents the time when the article was cited for the first time, while the outer orbits of the central part are other times of the article citing that correspond to the timeline

color. The node size indicates the frequency of citing the article by other authors. The larger the radius is, the more often the article is cited in other works. These key nodes can bind not only different time periods, but also various fields of research (Fujita, Kajikawa, Mori, & Sakata, 2014).

The analysis revealed 8 research fronts (clusters), three of which are the largest ones (Figure 5).

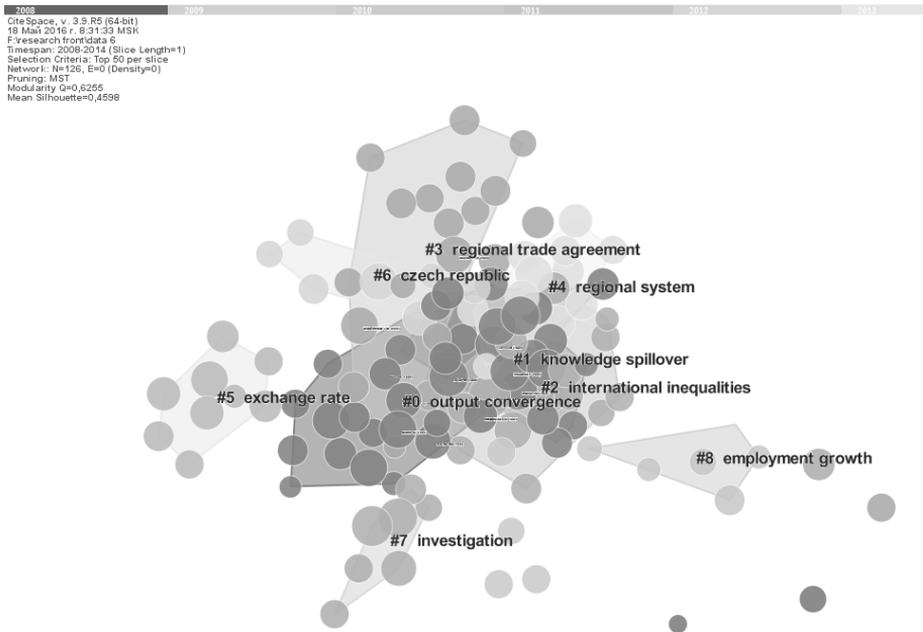


Figure 5. Clusters in the research of regional development

Analysis of publications included in the largest clusters allowed revealing and formulating of their main topics. The research fronts themes were determined by the titles, keywords and other information from the publications (Table 1).

Table 1. Summary of the largest 8 clusters

ClusterID	Size	Silhouette	Mean (Year)	Label (TFIDF)
0	20	0,763	1992	(10,56) output convergence; (10,46) convergence; (9,22) culture; (8,62) regional innovation activities; (8,62) nonparametric growth regression
1	17	0,662	1979	(10,17) knowledge spillover; (10,17) Guangdong province; (9,67) division; (9,22) industry cluster; (9,1) specialization
2	15	0,774	1994	(11,29) international inequalities; (11,29) globalization; (10,55) gap; (10,55) new economic geography; (10,55) adding geography
3	14	0,819	1991	(14,42) regional trade agreement; (11,91) third-country effect; (10,55) testing; (10,55) free trade agreement; (10,55) partial-scope regional trade

				agreement
4	12	0,725	2000	(11,91) regional system; (9,73) regional policy; (9,65) international business theory; (9,65) key factor; (9,65) firm competitiveness
5	9	0,96	1990	(10,55) exchange rate; (9,65) regional house price; (8,51) convergence; (8,49) exchange rate uncertainty; (8,49) panel co integration test
6	7	0,733	1996	(5,59) Czech republic; (5,59) growth pro-poor; (5,59) Balkan region; (5,26) knowledge production; (5,26) convergence
7	7	0,835	1993	(10,55) investigation; (8,49) empirical investigation; (8,49) advanced economies; (7,88) new approach; (7,88) convergence issue
8	5	0,98	2002	(8,49) employment growth; (8,49) employment effect; (7,88) new business formation; (6,93) sector; (6,85) gazelle

The largest cluster (#0) has 20 members and a silhouette value of 0,763. It is labeled as “economic growth” by log-likelihood ratio (LLR), “output convergence” by TFIDF ((Term frequency (the frequency of the word) and IDF - inverse document frequency (frequency of the document)) - a statistical measure used to assess the importance of the word in the context of the document, which is part of a collection of documents (Jones, 2004)), and “enterprise productivity” by mutual information (MI). The most active citer to the cluster is 0,45, Ashraf (2010).

The second largest cluster (#1) has 17 members and a silhouette value of 0,662. It is labeled as “knowledge spillover” by both LLR and TFIDF, and as “development zone” by MI. The most active citer to the cluster is 0,47, Fu (2010).

The third largest cluster (#2) has 15 members and a silhouette value of 0,774. It is labeled as “international inequalities” by both LLR and TFIDF, and as “regional consumer price difference” by MI. The most active citer to the cluster is 0,4, Zeng (2010).

The period of research front occurrence is the one with the most intense citation activity recorded for these scientific topics. Highly cited articles belonging to a particular cluster could be published in an earlier period as evidenced by the data presented in Figure 6.

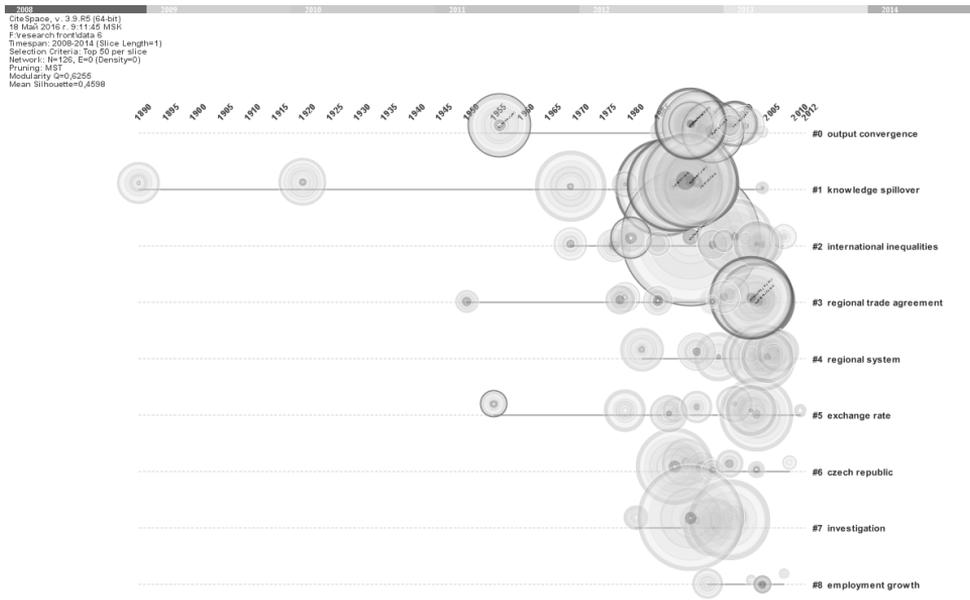


Figure 6. The timeline visualization of clusters and their labels

The most significant publications with high frequency of citation and the most significant authors are the following: the top ranked item by citation counts is Krugman (1991) in Cluster #2, with citation counts of 161; the second one is Arellano (1991) in Cluster #7, with citation counts of 129; the third is Porter (1990) in Cluster #1, with citation counts of 114; the 4th is Romer (1986) in Cluster #1, with citation counts of 111; the 5th is Lucas (1988) in Cluster #1, with citation counts of 108.

Another important characteristic is the publication centrality, which quantitatively shows the importance of the publication in the network. Centrality is a characteristic determined by the CiteSpace, it shows the publication ability to integrate other publications. Typically, high centrality publications integrate publications in one area of research. The top ranked item by centrality is Jaffe and Henderson (1993) in Cluster #1, with the centrality of 0,38. The second one is Romer (1986) in Cluster #1, with the centrality of 0,32. The third is Barro (1991) in Cluster #0, with the centrality of 0,32. The 4th is Wooldridge (2002) in Cluster #3, with the centrality of 0,26. The 5th is Anderson (2003) in Cluster #3, with the centrality of 0,26. The 6th is Krugman (1991) in Cluster #1, with the centrality of 0,25. The 7th is Lucas (1988) in Cluster #1, with the centrality of 0,22. The 8th is Hall (1999) in Cluster #0, with the centrality of 0,20. The 9th is Broadberry (1992) in Cluster #0, with the centrality of 0,19. The 10th is Solow (1956) in Cluster #0, with the centrality of 0,17.

Analysis of the global publication activity in the field of the regional economy using the data presented in the scientometric database Web of Science for the period of 2008-2015 has shown that the greatest activity is typical for the United States, Western Europe and Asia-Pacific (Figure 7). Only a small number of Russian publications is presented in the international scientometric databases.

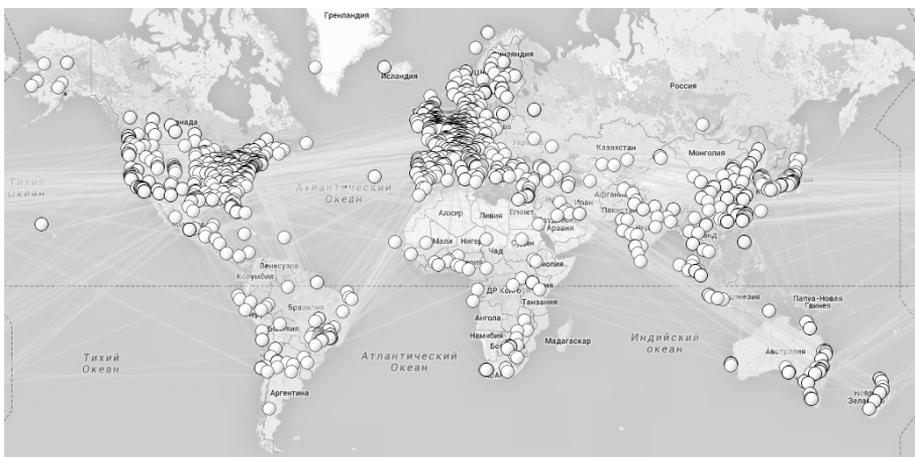


Figure 7. The worldwide geographic distribution of research paper and international collaboration during 2006 – 2015

The studies show a great impact of research communication between scientists on the publications quality (Carillo, Papagni, & Sapio, 2013; Hart, 2000). This may be caused by the fact that interaction between scientists at the level of research networks affects the quality of publications and acts as a peer review (Rigby & Edler, 2005).

As can be seen in the figure, most scientific publications are made in the process of international cooperation, and only a small number of publications in the field of regional economic development are isolated. Poor communication with the scientific community leads to research initiatives clustering, which slows down the advancement of research and identification of promising opportunities for the development of regional economic systems.

A relevant issue for the Russian scientists is the problem of perspective directions determining in the field of regional economy researching. The domestic database RISC is only developing and therefore does not allow carrying out full bibliometric analysis. For the bibliometric analysis, methods of semantic analysis were used. As a result, a semantic core was identified, which reflects the main focus of research by the Russian scientists in the field of regional economic development. The main research areas are presented in Table 2.

Table 2. The semantic core of the most important publications in the field of regional development

Year	Semantic kernel of publications (in brackets shows the usage of words and phrases,%)
2006	Farm (1.07), rural (0.98), development (0.96), agricultural (0.66), science (0.66), agriculture (0.64), problem (0.57), policy (0.51), manufacturing (0.47), agribusiness (0.41), control (0.39), differentiation (0.27), complex (0.27)
2007	Intensification (1.33), manufacturing (1.17), science (0.88), efficiency (0.74), development (0.74), control (0.53), the intensification of production (0.49), problem (0.49), system (0.47), economy (0.41), model (0.37), process (0.37), industry (0.31)
2008	Development of (1.45), network economy (1.14), control (0.90), planning (0.82), cluster (0.75), program (0.75), system (0.59), model (0.55), policy (0.51)
2009	Development of (0.99), system (0.72), theory (0.69), innovation (0.68), science (0.55), control (0.47), financial (0.44), finance (0.36), policy (0.35), bank (0.34), innovation (0.28), strategy (0.28)

2010	Development of (1.36), space (1.00), spatial economics (0.80), science (0.75), system (0.50), knowledge (0.45), innovation (0.45)
2011	Development of (1.08), science (0.82), control (0.65), agribusiness (0.40), institute (0.40), manufacturing (0.34), institutional (0.32), state (0.28), marketing (0.27)
2012	System (1.67), innovation (1.04), control (0.94), safety (0.69), economic security (0.59), competitiveness (0.45), stable (0.45), innovative development (0.42)
2013	Management (0.73), social (0.63), entrepreneurship (0.59), WTO (0.40), institutional (0.36), socio-economic (0.36), level (0.36), macro-region (0.33)
2014	Development (3.05), region (1.69), economic (1.23), policy (0.84), control (0.84), potential (0.71), industrial (0.71), level (0.71), condition (0.71)
2015	Development (2.29), regional (1.47), formation (1.06), economics (1.06), condition (0.94), economic (0.90), state (0.82), control (0.82), industrial (0.78), enterprise (0.74), support (0.65), system (0.65)

As can be seen in the table, general studies predominate in most of the Russian studies focused on the increase of regional economic systems manageability, identification of their development problems in the period of transition to the market model of management, which is new for modern Russia. However, publications devoted to the formation of the information society foundations began to appear since 2007. This is evidenced by the appearance of such keywords as knowledge and network economy in the field of regional economy researching.

The carried-out bibliometric analysis has shown that Russia is far away from the fronts of scientific studies in the field of mechanisms, ways and branch aspects of regional economy development. The absence of the formed knowledge space uniting the efforts of scientific schools, competence centers, separate scientific centers, working groups remains an internal problem. Full-scale databases are not formed on the results of scientific researches in various forms and scientific publications use. The majority of organizations engaged in scientific researches have no access to famous foreign research and development databases or publications, which prevents estimating perspective scientific and technical achievements all over the world and revealing the scientific results, which Russian enterprises are also interested in.

Conclusion and discussion

Thus, the use of bibliometric methods is a very useful and convenient tool for planning and assessment of scientific activity in the field of scientific research strategy implementation.

As a result of studying, three main clusters were revealed in the field of regional economy development: "economic growth", "knowledge spillover", "international inequalities". The research fronts are interdisciplinary clusters and include publications from several adjacent scientific areas. Clusters researching helped to draw a map of regional economy studies, determine important and relevant topics in this area and also make it possible to promote further studying of regions development.

Results of publishing activity by the Russian scientists demonstrate the increase of research activity in the field of regional economic systems in the Web of Science database. However, the bibliometric analysis of the scientific publications flow shows

an essential restriction set for the exchange of scientific information. Low level of Russian scientists' communication with the foreign scientific environment results in clustering of the Russian research initiatives slowing down the research advance and determination of Russian regions development perspective.

The carried-out bibliometric analysis showed that Russia is far aside from the fronts of scientific studies in the field of regional economy mechanisms, ways, and branch aspects. The Russian publications are more focused on theoretical research than practical orientation. The absence of formed knowledge space uniting the efforts of scientific schools, competence centers, separate scientific centers, working groups remains an internal problem. Full-scale databases are not formed on the results of scientific researches in various forms and scientific publications use. The majority of organizations engaged in scientific researches have no access to famous foreign research and development databases or publications, which prevents estimating perspective scientific and technical achievements all over the world and revealing the scientific results, which Russian enterprises are also interested in.

Comparison of the research fronts between foreign publications and the Russian subjects can become a basis for perspective research directions forecasting. However, this activity needs a depth study, and its development can become a serious factor of justification for the development of research directions support of regional economic systems in Russia.

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