
Clustering as a Basis for an Innovative Development Strategy

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Abstract:

This paper considers the cluster approach as a basis for the innovative development strategy of Russia's regions and gives an overview of foreign experience in implementing cluster policy for regional development in modern market conditions.

We compare clusters models depending on their belonging to different industries, identify factors and tools for cluster formation and give an assessment of their impact on regional innovative development.

The study gives recommendations for determining the performance of innovative clusters in regional strategic development.

Keywords: *Cluster, R & D expenses, special economic zones.*

JEL Codes: *O3, O32.*

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1. Introduction

Currently, the study of the methodological foundations for the development of cluster formations, in particular innovative ones, has become widespread, as shown in Tables 1-3. Sala *et al.* (2016) examine the influence of the development level of clusters on the competitiveness level of countries, regions, and areas, as well as establish a close relationship between these two parameters. They show that the innovative activity level of companies participating in the cluster is higher than that of similar companies operating outside the cluster, which is reflected in Table 1.

Table 1. *Innovation is higher in clusters than out of them*

Indicators	Innovative cluster companies	Innovative companies
Introduce new or significantly improved products or services	78	74
Introduce new or significantly improved production technology	63	56
Conduct market research for introducing new products or services	53	33
Carry out research in your own laboratories	44	53
Contract out research to other firms, universities or research institutes	41	20
Register one or more international trademarks	29	14
Apply for one or more patents	29	12

The Report TCI (2016) on the activities and prospects for the development of innovation clusters states that the implementation of cluster policy implies concentrating efforts on a region's strong positions, rather than developing weak positions or eliminating negative aspects. The main conclusions were grouped into sections, which are reflected in Table 2.

Table 2. *Key characteristics of the concept of "cluster"*

Conclusions	Content
1. Cluster evaluation	By analyzing competitiveness it is possible to increase cluster health and competitiveness
	Clusters add value to and spark innovation in companies in the cluster
	There is no one-size fits all for cluster policies
2. Cluster governance	For a policy to be successful there needs to be engagement from all parties involved
	The role of the "orgware" is not to be understated in this process, without key figures, the implementation of these policies might be less successful
3. Cities & competitiveness	Cities and metropolitan areas are increasingly seen as a key driver of value creation and a key partner in enhancing competitiveness
	There is no one-size-fits-all for cluster policies

	The influence of the government should be limited to facilitation, not management
	Government funding is crucial for the initial phase of cluster formation
	Clusters can fail due to several reasons; a large part of them is related to the performance of the cluster manager
4. Understanding the dynamics of territory: there are basically 4 regions	Strong physical infrastructure and supporting institutions with growth
	Strong physical infrastructure and supporting institutions with stagnation or decline
	Weak physical infrastructure and supporting institutions with growth
	Weak physical infrastructure and supporting institutions with stagnation or decline
5. A taste of worldwide cluster approaches	Successful cluster initiatives with a strong champion can influence national policies
	Industries can initiate successful clusters with additional help of the government
	Clusters can help development in regions, even or especially those that are lacking in development

Source: Report TCI (2016).

The role of the government in supporting and stimulating regional economies within the framework of cluster policy is currently a relevant direction in studying the prospects for cluster development. In this regard, Mills, Reynolds and Reamer (2016) introduce the following terms and definitions: regional industry cluster, cluster initiatives and cluster initiative programs, as shown in Table 3.

Table 3. Terms and definitions of the concept of “cluster”

Term	Definition
Regional industry cluster	A geographic concentration of interconnected businesses, suppliers, service providers, and associated institutions in a particular field
Cluster initiative	A formally organized effort to promote cluster growth and competitiveness through collaborative activities among cluster participants
Cluster initiative program	An effort to create and sustain a series of cluster initiatives

Source: Mills et al., 2016.

The study of Mills et al. (2016) is based on the findings of Porter (1990), which is reflected in Table 4.

Table 4. Strong clusters lead to higher regional wages, particularly in the traded sector in 2004

Top 10	Percent of traded employment in “strong” traded clusters, %	Regional employment	Average regional wage, USD	Average regional traded wage, USD
Trenton, NJ	82,7	185,383	46,39	60,677
Palm Bay, FL	80,8	174,83	33,571	44,988

San Jose, CA	79,7	861,94	68,559	96,602
Durham, NC	78,4	221,362	43,634	73,757
New York, NY-NJ-PA	76,7	7,584,299	52,377	80,068
Boston, MA-NH	73,6	2,259,198	49,171	70,458
Las Vegas, NV	73,4	739,434	33,884	34,394
Harrisburg, PA	73,3	273,181	34,054	37,836
Bridgeport, CT	72,6	450,517	62,420	109,384
Dayton, OH	69,4	357,719	33,742	45,069
Top 10 weighted average			50,817	75,246

Source: Porter (1990).

Nijkamp (2016) examines the experience of implementing cluster policies in various countries and regions, assesses the advantages and disadvantages of the cluster development strategy, and compares regional policy types, depending on the chosen object (Tyaglov *et al.*, 2017). Based on the analysis, he introduces the notion of a "resourceful region", which reflects a new concept of integration policy in a region characterized by the following constituent elements: economic potentiality; educational/creativity facilities; spatial networks in terms of accessibility and connectivity; ecologically sustainable quality conditions; historico-cultural support mechanisms (Kolchanova and Kolchanova, 2016).

Currently, the concept of cluster development is undergoing significant changes. Willen and Zuazua (2017) formulate the definition of an "economic cluster", acting in various forms: special economic zones, industrial zones, free zones, economic cities and technological clusters. There are the following categories of instruments:

1. Measures aimed at improving innovation governance and strategic intelligence for policy making.
2. Measures aimed at fostering an innovation friendly environment.
3. Support for higher education and human capital development.
4. Development of research infrastructure in universities and research centers.
5. Strengthening entrepreneurial innovation in the SME sector.
6. Industrial and strategic technology policy focusing on large scale projects in specific industries or technology fields.
7. Encouraging technology and knowledge transfer to enterprises through the creation of technology intermediaries, support for spin-offs, support funding for university-industry cooperation, and student exchange programmes.
8. Development of innovation poles and clusters through the funding of sustainable R&D and business networks of firms and research organizations; creation of networks/cluster schemes based on partnerships between regional authorities, industry and universities; promotion of international networks.

9. Promote and sustain the creation and growth of innovative enterprises through financial support instruments.

Tsertseil *et al.* (2017) consider the basic principles of the emergence and development of clusters in the regional economy by the example of the petrochemical cluster in the Republic of Tatarstan. They identify the main groups of participants in this cluster and analyze the main trends in the development of innovative products in the regional cluster's territory, which is reflected in Table 5.

Table 5. *Tatarstan Republic regional chemical cluster enterprises and participants*

Group	Cluster Participants	Economic Sector
1	Nizhnekamsk Technical Carbon Plant (NZTU), TAIF - NK Refining Complex PJSC, Nizhnekamskneftechim (NNCH) PJSC, Nizhnekamskshina (NSH), Kazan Organic Synthesis Plant (KOS), Karpov Chemical Plant, SNRG Logistic LTD, KZSL Kazan Synthetic Rubber Plant, Nefis Cosmetics PJSC	Extractive/Mining, Processing Industry
2	Research Institutes	Service Industries
3	Himgrad Technopolis, Idea Industrial Park, Alabuga production and industrial-purpose special economic zone, Nizhnekamsk industrial district of Nizhnekamskneftechim PJSC enterprise	Infrastructure
4	State Authorities	Establishment of the legal framework for simulation of the innovative activity of large and medium enterprises; approval of development programs for support of the chemical industry; development of infrastructure facilities in the region, in particular, within specific economic zones of production-and-industrial and technical-and-innovation types.

Source: Tsertseil *et al.*, 2017.

2. Cluster models

In the context of market conditions and the globalization of world economic relations, Porter's (1990) provisions, in particular, his "diamond of competitiveness", have become widely used. We can find and compare different clusters models by the example of London and Singapore, as shown in Tables 6-8.

Table 6. *Model "London Fin Tech Cluster Map"*

Promotional organizations	Regulatory authorities	Related industries
Tech City UK British Business Bank FinTech City	EU, Basel Committee, UK FSA, HM Treasury, Bank of England	General London Startup Ecosystem Specialized Risk Capital
	Fin Tech Sub-Clusters	

Specialized incubators IFCs (e.g. Innovate Finance, FDATA, P2PFA) Mayor of London UK Trade & Investment Authority	Payments & Remittances Lending & Banking Investments & Insurance Software & data	Securities Exchanges Specialized Business Services
Infrastructure	Educational Institutions	Financial Institutions
Business infrastructure: Fiber, Telcos, airports, business, hospitality	UK universities London's talent pool in financial institutions Industry sponsored financial education	Intl. and UK investment and retail banks Insurance businesses
Employee Related: Housing, transportation, quality of life		Global Tech and TelCos Front-runners and early investors in TechCity

Source: Davis et al., 2016.

Table 7. Model “London's FinTech Diamond”

Country diamond	List of factors
Factor conditions	(+) Very good of financial and entrepreneurial talent (+/-) Education: strong universities (+) World class infrastructure (telco, transportation) (-) Tightening visa policies for majority of talent (-) Higher labor costs vs e.g. India or Eastern Europe
Context for Firm Strategy & Rivalry	(+) Government support (+/-) Attractive quality of life but high cost of living (-) Potential threat from Brexit (-) Potential threat from possibly undifferentiated EU regulations, low likelihood currently
Demand conditions	(+) London has the world's highest concentration of global financial institutions (banking, capital markets, insurance, asset management) (+) Local SMEs and individual consumers are digitally savvy and have shown already strong uptake/demand for FinTech innovations (e.g. contactless pay) (+) High proportion of the population is underbanked (+) Geographic proximity to other European countries (-) Relatively small local demand in SMEs and individual segments
Related & Supporting industries	(+) Strong VC/PE community (+) Sophisticated financial markets (LSE) (+) International Investment banking hub (+) Large number of high caliber local service providers (telco, IT, law, consulting, tax etc) (-) Gap in funding vs US (VC and IPO level) due to lack of track record and cultural risk version risk

Source: Davis et al., 2016.

Table 8. Model “Singapore's National Diamond (Higher Education Cluster)”

Country diamond	List of factors
Factor conditions	(+) High quality human capital (+) Excellent primary and secondary education (+) Strong labor market (+) Developed infrastructure (-) Low fertility rates and ageing population (-) High cost of living
Context for firm rivalry	(+) Ease of doing business (+) Knowledge based economy (+) Strong competitiveness stance (+) Government regulation (+) Openness to foreign investors (-/+) Productivity is slowing down (-) High cost of labor
Demand conditions	(+) Active government involvement in market failures (+) High exposure to global markets (-/+) Rise of other Asian countries (-) Small potential in local market
Related supporting industries	(+) Diverse economy (+) Well developed cluster (-/+) Limited R&D investments (-) It cluster is losing world market share

Source: Alfaro and Ketels, 2016.

3. Identification of factors and tools for cluster formation

An important component of the development of the country's economy is innovative activity, the development level of which creates the basis for the sustainability of economic growth and contributes to the implementation of strategic tasks of territory development. Innovative potential is an indicator of innovative activity development. This article is focused not on the controversial questions of methods for determining innovative potential, but on the data of the Russian Statistical Organization – Rosstat.

In accordance with Rosstat's methodology, innovative potential is determined by the ratio of the number of organizations that implemented technological, organizational and marketing innovations to the total number of organizations surveyed. In conditions when the region's innovations and innovative activity are an important tool for implementing strategic tasks, it is important to evaluate innovative potential. Potential is characterized by the regularity and efficiency of innovation as well as the dynamics of actions to develop and implement innovations. We consider innovative potential a characteristic of the region's innovative activity, which fixes the current state to make an optimal managerial decision in the field of innovation development.

We examined the correlations in identifying the relationship between the realized costs for technological (food, process) innovations in total and the costs for research and development of new products, services and methods of their production (transfer) and new production processes, particularly in 2016.

Currently, according to the Russian Cluster Observatory, in Russia clusters operate on the following territories: Republic of Tatarstan, Leningrad Region, Samara Region, Tomsk Region, Ulyanovsk Region, Altai Krai, Arkhangelsk Region, Kemerovo Region, Moscow Region, Nizhny Novgorod Region, Sverdlovsk Region, Kaluga Region, Krasnoyarsk Krai, Novosibirsk Region, Republic of Mordovia, Perm Krai, Republic of Bashkortostan, Khabarovsk Krai, Moscow City, St. Petersburg City.

According to Figure 1, the largest amount of costs for technological (food, process) innovations in total in 2016 was carried out in Moscow, then by the degree of decrease: Moscow Region, St. Petersburg City, Nizhny Novgorod Region, Republic of Tatarstan, Sverdlovsk Region, Samara Region, Perm Krai, Krasnoyarsk Krai, Republic of Bashkortostan.

Figure 1. The amount of assimilated costs for technological (food, process) innovations in total in 2016 (information on costs was updated on October 25, 2017 on the official website of the Federal State Statistics Service), million rubles

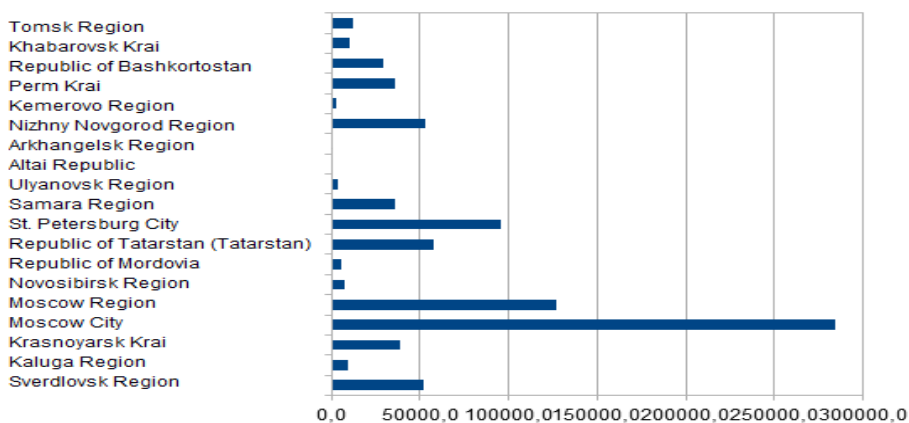


Figure 2. The relationship between the cost for technological (product, process) innovations in total and the amount of innovative products manufactured in 2016 in Russia's cluster territories (information on costs was updated on October 25, 2017 on the official website of the Federal State Statistics Service), million ruble

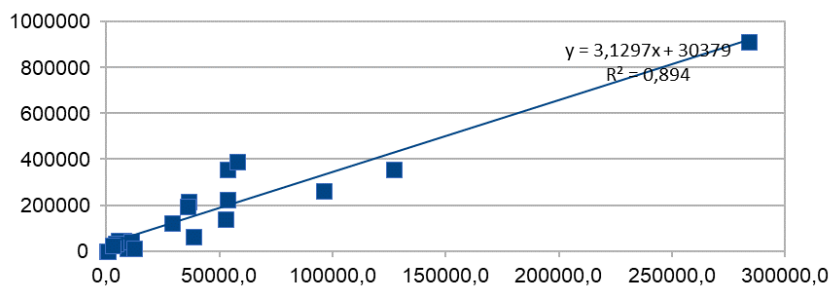
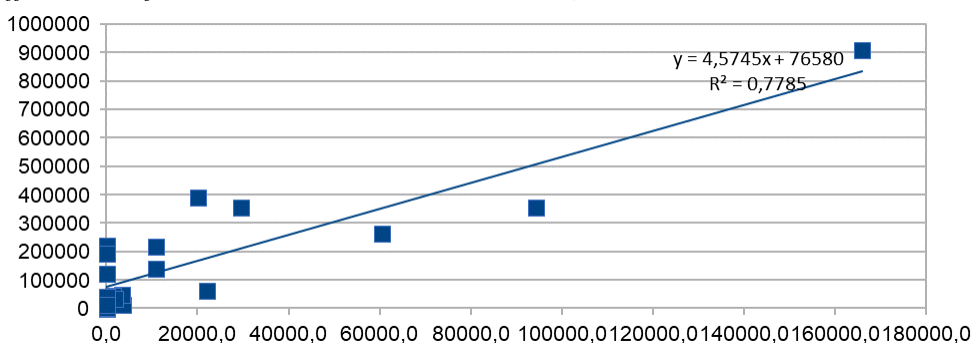


Figure 3. The relationship between the costs for research and development of new products, services and methods of their production (transfer), new production processes and the amount of innovative products manufactured in 2016 in Russia's cluster territories (information on costs was updated on October 25, 2017 on the official site of the Federal State Statistics Service), million rubles.



4. Special economic zones as a tool for Russia's cluster development

The creation and development of special economic zones in the region is a tool for support of regional entities that carry out economic activities within the cluster's territories. Special economic zones play a key role in the development of the economies of countries and regions. Within a special economic zone, the construction of cluster infrastructure facilities and the conduct of research and development is faster, as they are a tool for state support provided to economic subjects in the region. The following principles for the construction of facilities of a special economic zone located on the territory of Russia can be determined:

- a cluster approach to ensuring optimal production linkages;
- ensuring the sustainable development of territories with their intensive use;
- ensuring a balanced consideration of environmental, economic, social and other factors in the planning and construction of infrastructure facilities for special economic zones of industrial-production type and technology-innovative type.

Table 9. *Characteristics of special economic zones of industrial-production and technology-innovative types in Russia*

Name	Advantages	Location
Technology-innovative	Access to the rapidly developing Russian IT and R & D market Highly qualified specialists High potential of cooperation with scientific and research centers Business incubators for start-up projects	Moscow City, Moscow Region, Saint Petersburg City, Tomsk Region, Republic of Tatarstan
Industrial-production	Location in the most economically developed regions of Russia Prevalence of industrial enterprises Availability of a developed transport infrastructure Availability of natural resources Availability of skilled labor	Lipetsk Region, Republic of Tatarstan, Samara Region, Sverdlovsk Region, Kaluga Region, Pskov Region, Tula Region, Astrakhan Region, Moscow Region

Currently, the following tools for state support provided to economic subjects in the region are formed on the territory of Russia:

1. Grants and subsidies: reimbursement of expenses for loans, leasing, technological connection, goods promotion, increasing energy efficiency, for innovation, for performance of state and municipal tasks, for staff development.
2. Loans and borrowings.
3. Investments: equity and venture financing.
4. Guarantees and sureties: sureties on bank loans, guarantees, leasing, guarantees on export transactions.
5. R & D contracts.
6. Insurance of agricultural activities.
7. Leasing: financial leasing.
8. Preferential taxation.
9. Property support: creation of innovative business incubators, technology parks, technology centers.
10. Special economic zones in the region: industrial-production special economic zones, technology-innovative special economic zones.

Currently, special economic zones of industrial-production and technology-innovative types are located on the following territories: Astrakhan Region, Kaluga Region, Lipetsk Region, Moscow Region, Republic of Bashkortostan, Republic of Tatarstan, Pskov Region, Sverdlovsk Region, Samara Region, Tomsk Region, Tula Region, Moscow City, St. Petersburg City.

In this paper, we investigated the relationship between the realized costs for technological (food, process) innovations in total and the costs for research and development of new products, services and methods of their production (transfer) and new production processes, particularly in 2016 in the regions, where special

economic zones of industrial-production and technology-innovative types are located.

Figure 4. The relationship between the costs for technological (product, process) innovations in total and the amount of innovative products manufactured in 2016 in Russia's regions, where industrial-production and technology-innovative special economic zones are located (information on costs was updated on October 25, 2017 on the official website of the Federal State Statistics Service), million rubles

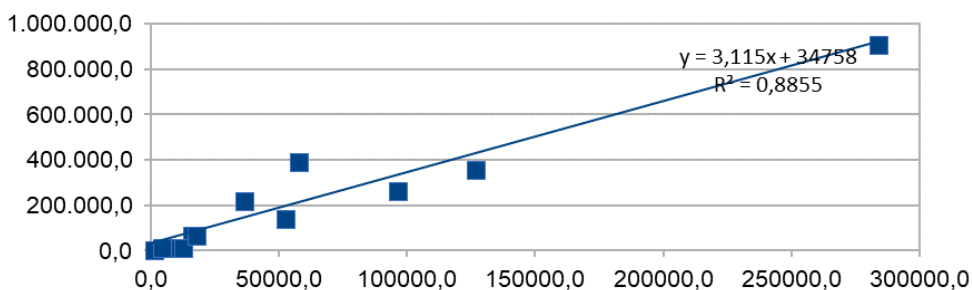
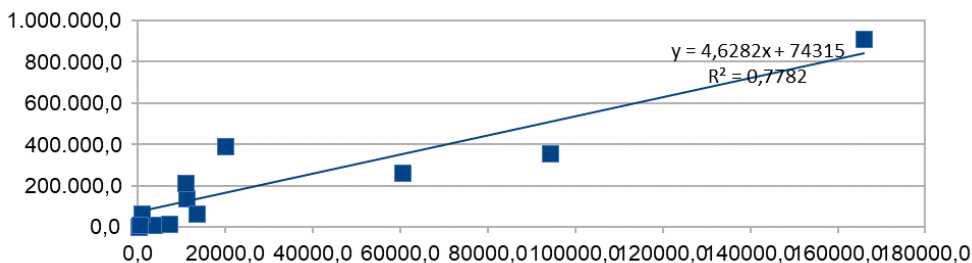


Figure 5. The relationship between the costs for research and development of new products, services and methods of their production (transfer), new production processes and the amount of innovative products manufactured in 2016 in Russia's regions, where industrial-production and technology-innovative special economic zones are located (information on costs was updated on October 25, 2017 on the official website of the Federal State Statistics Service), million rubles.



5. Conclusions

The main problem hampering the development of innovative activity and, consequently, the formation of innovative clusters is the weak state regulation of the innovation sphere. The main functions of the state regulation of the innovation sphere are as follows:

- 1) accumulation of funds for research and innovation;
- 2) stimulation of innovations, competition in this sphere, insurance of innovative risks;

- 3) creation of the legal framework for innovation processes, especially the system for protecting the copyright of innovators and intellectual property;
- 4) staffing of innovative activity;
- 5) formation of scientific and innovation infrastructure;
- 6) institutional support of innovation processes in the public sector;
- 7) ensuring the social and environmental orientation of innovation;
- 8) increasing the social status of innovative activity;
- 9) regional regulation of innovation processes;
- 10) regulation of international aspects of innovation processes, etc.

Conclusions about the positive impact of economy clustering on the state development level are based on several features emerging for economic entities that are participants in the innovation cluster: uniqueness of the internal environment and cluster infrastructure; strengthening of interconnections and formed relations between participants; information openness, trust among cluster subjects; change of the intellectual capital of the company/cluster as a whole; increasing the level of employees' competence, changing the style and psychology of management, improving social security, building new communication networks; access to new technologies, R & D findings; joint scientific research with a view to further introduction into production; financing effectiveness; cost reduction; stable position in the market; positive impact on other economic entities in the region; positive experience of the cluster and its participants affecting the reputation of the region and the country as a whole.

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References:

- Alfaro, L. and Ketels, C. 2016. Singapore's Higher Education Cluster. Harvard: Harvard Business School.
- Davis, J., Gremmelmann, L., McCarthy, B., Pietrella, S. and Whiting, G. 2016. The UK's Fintech cluster. Leveraging the UK's strengths in financial services, technology and entrepreneurship. Microeconomics of competitiveness. Harvard Business School.
- Kolchanova, A. and Kolchanova, P. 2016. Solving Enterprise Management Problem with Cluster Technologies and ERP – Systems (in the Context of Capital CSE System). *European Research Studies Journal*, 19(2), 299-306.
- Mills, K.G., Reynolds, E. B. and Reamer, A. 2016. Clusters and Competitiveness: A new Federal Role for stimulating regional economies. *Blueprint for American Prosperity*. Metropolitan Policy Program. Available at: <https://www.brookings.edu/wp-content/uploads/2016/07/Clusters-Brief.pdf>
- Nijkamp, P. 2016. The "resourceful region". A new conceptualisation of regional

- development strategies. *Journal of Regional Research*, 36, 191-214.
- Porter, M.E. 1990. *The Competitive advantage of nations*. New-York, Free Press.
- Sala, D.C., Maticiuc, M.D. and Munteanu V.P. 2016. Clusters influence on competitiveness. Evidences from European Union countries. *Proceedings of the 10th International management conference "Challenges of Modern Management"*, November 3th-4th, Bucharest, Romania.
- Tsertseil, J., Kookueva, V. and Ordov, K. 2017. Regional competitiveness within the cluster's territory: case of the Volga Federal District's chemical industry. *Progress in Economic Research*, 37. New York, Nova Science Publishers.
- Tyaglov, G.S., Kushnarenko, V.T., Khokhlov, A.A. and Qeropyan, A.M. 2017. The Development of Cluster Relations within the State and Business Structures in Terms of Strategy of Non-Primary Sector Import-Substitution. *European Research Studies Journal*, 20(1), 198-207.
- Willen, B. and Zuazua, M. 2017. Next generation economic cluster. AT Kearney.