

Formation of Knowledge Economy in the “Recourse Type” Regions

A I Zaytseva¹, L S Sagdeeva¹, S A Savitseva¹

¹Kemerovo State University, Kemerovo, Russia

E-mail: Lit-ani@mail.ru

Abstract: The subject of this article is the economic relations that make up the process of formation and development of the knowledge economy in resource-type regions. The aim of the research is to reveal the essence of a knowledge-based economy, its inherent regularities and features at the regional level. Scientific research has been focused on the material aspects of the reproductive process for a long time. At present, a new paradigm based exclusively on theories of sustainable and human development, as well as the knowledge economy, is formed. The concept of the knowledge economy is a new course of economic development. The article reveals a system of indicators of the knowledge economy. The basic requirements for this system are formulated. The assessment of the knowledge economy in the regions of Russia from 2005 to 2017 was completed. The main factors determining the possibilities of industrial development and economic growth of the regions of the "resource type" are revealed on the example of the Kemerovo region. The necessity for the formation of organizational elements of the regional innovation system was demonstrated. The necessity of transformation of the labor market and modernization of the education system in the region as one of the directions of the knowledge economy is also substantiated. The presented results of the research made it possible to conclude that higher education is not tuned to the preparation of genuinely demanded professions, but focuses directly on the interests of entrants. The amount of damage from non-use of higher education, obtained by graduates is calculated and presented in the article. Recommendations for the system of higher professional education are suggested.

1. Introduction

The material aspects of the reproductive process have been an issue of researchers' great interest for quite a long time. Only in the early 1990s a new paradigm based only on the theories of sustainable and human development was formed.

One of the tasks of modernizing Russian society is to increase the competitiveness of the modern economy associated with the development of a new direction - the knowledge economy. Since the raw-material model of the economy today can no longer be considered as basic, it requires a replacement for another - a more efficient model. In this situation, the current research emphasis is shifting towards a new type of economy - the knowledge economy.

The term "knowledge-based economy" was first introduced into scientific circulation by the American scientist Fritz Machlup [1]. He was the first who identified the sector of the economy, focused on the production of knowledge. In subsequent years, approaches to the interpretation of the terms "knowledge-based economy", "knowledge economy", "innovative economy" have been repeatedly changed and supplemented [2]. Many leading economists do not share these concepts,



considering the development of the economy and society as one process in the problems of the "knowledge economy". At present time, these terms are used to determine the type of economy in which knowledge plays a major role, and production is the source of growth [3].

Russia is one of those countries for which the regional aspect of economic development is most relevant because of the uneven development of its regions. Implementation of innovation policy is one of the basic principles of regional development. This situation is also true for the Kemerovo region - a typical raw material region [4].

Some industrial enterprises, such as OJSC "SUEK-Kuzbass" and "SDS-Ugol", public corporation "Raspadskaya" and others, successfully implement various modernization programs and introduce new innovative technologies. In this regard, the requirements to the knowledge, skills and competencies of employees of such enterprises immediately change.

To assess the process of forming the knowledge economy in resource type regions, the system of indicators and indexes and the main requirements for them has been identified.

Currently, a significant number of different systems of indicators and indexes have been developed. They are used for comparative analysis of different countries and world regions development towards the creation of an information society, the formation of a knowledge economy, the introduction of e-government technologies, the use of information and communication technologies in the field of culture and education, etc [5].

The indicators characterizing science intensity and science efficiency, in other words, the efficiency and competitiveness of the national economy, are used to analyze the country's place in the world scientific and technological space.

The science intensity indicators are:

- share of R&D expenditure in country's GDP;
- absolute number of researchers in the country;
- share of researchers in the country [6].

The science efficiency indicators include:

- the size of GDP per employee;
- competitiveness of national economy;
- share of high-tech exports in the country's total commodity exports [7].

All these indicators have to meet the following requirements:

- the need to integrate the maximum number of factors and conditions;
- transparency and accessibility for making calculations or obtaining estimates;
- the need to ensure maximum compatibility and comparability of indicators for different conditions of its implementation, as well as for the application of these indicators in different countries [8].

These indicators are applicable to assessing the state of the knowledge economy nationwide and can't be used in the aspect of regional assessment. So in this study the methodology of the World Bank (Knowledge for Development Program - K4D) has been used for the assessment of formation of the knowledge economy in resource-type regions of process during the period from 2005 to 2017 [9].

According to this methodology knowledge economy index (KEI) is the main complex indicator to assess the effectiveness of the country's use of knowledge for the purpose of its economic and social development. It characterizes the level of development of a country or region in relation to the knowledge economy.

KEI is the arithmetic average of four sub-indexes: "Economic incentives and institutional system", "Education and qualifications", "Information infrastructure", "Innovation system". Each sub-index has three indicators with the same weight (see Fig. 1).

The complexity of the analysis of the group of resource-producing regions is connected, first of all, with the lack of a unified approach that allows one or another region to be assigned to this group on the basis of objective indicators [10].

Since there is no category "resource sector of the economy" in the Russian statistical register, data on the structure of gross value added of the region can be used for its allocation. According to the

specialists of The Ministry of Economic Development and the Russian Academy of Science the term "resource-producing regions" should be attributed to those regions for which the share gross value added for the group "mining" exceeds the national average. Since the average Russian indicator of gross value added for the group "extraction of useful fossils" in the analyzed period ranged from 9 to 15%, then we will take as an allocation rate of "resource-type region" the regional limit is 15%. So according to the structure of value added 18 regions are included to the group of resource-producing regions.

Economic incentives and institutional system	Education and qualifications	Information infrastructure	Innovation system
<ul style="list-style-type: none"> • tariff and non-tariff barriers • quality of regulatory measures • rule of law 	<ul style="list-style-type: none"> • education level • secondary education coverage • high education coverage 	<ul style="list-style-type: none"> • phones • computers • internet users 	<ul style="list-style-type: none"> • royalties and license fees • patents • science articles

Figure 1. KEI structure [9].

Based on the knowledge index structures presented in Fig. 1 its values were calculated by the resource regions group. The following Table 1 give the list of the regions and values of knowledge economy index in different years.

According to the research results, Belgorod Region, Khanty-Mansi and Yamalo-Nenets Autonomous Areas, Kemerovo Region, The Republic of Yakutia are included to the group of leading regions in terms of the level of the knowledge economy development.

"Leaders" are characterized by a relatively high level of development of education, living conditions, the ICT Development Index and the innovation environment, while the balance between the indicators of each region development largely depends on regional features.

The "followers" group consists of the regions, in which the knowledge economy index is estimated in the range from 0.5 to 1.0 (Republic of Tatarstan, Murmansk and Magadan regions, Udmurtia and Komi Republics, Orenburg and Tyumen regions, Krasnoyarsk and Tomsk Regions). The value of the KEI has risen above the national average in these regions during the analyzed period.

This group of regions is characterized by a lower level of education and innovation development, while high values in living conditions and the ICT infrastructure development are still remaining.

The greater effectiveness of the regional innovation system (RIS) of the "leaders" in comparison with "followers" is indicated by the fact that despite close values of cost indicators and the employment structure, they have higher values of innovation activity.

The "Outsiders" are the Arkhangelsk region, the Chukotka Autonomous Area, the Republic of Khakassia and the Sakhalin Region.

The level of "outsiders" development in education and regional innovation system roughly matches with the similar level of "followers". So there is an average level of the education system development and low efficiency of RIS in these regions.

So, the "leaders" are characterized by a high potential in the development of the knowledge economy (due to the advantages in education) and the relatively high efficiency of innovative mechanisms. "Followers" also have significant development potential, but their RIS is currently very inefficient.

It was also revealed in the study that the differentiation of resource-producing regions in three types is based not only on the significant difference in the knowledge economy profile of the, but also on the difference in the environmental situation in the regions and its impact on the quality of life [11].

A key factor in the formation of a knowledge economy in resource-type regions should be a regional innovation system that is part of the national economic system or a set of subsystems focused

on generating changes in the economic system through the acquisition, production and dissemination of new knowledge [12].

Table 1. The values of the knowledge economy indexes in resource-type regions in 2005-2017.

Region of Russian Federation	KEI 2005	KEI 2011	KEI 2017	Variation 2017/2005
Tomsk Region	5,3	5,6	5,8	+0,5
Republic of Tatarstan	4,9	5	5,9	+1,0
Magadan Region	3,9	4,4	4,6	+0,7
Murmansk Region	3,3	3,9	4,2	+0,9
Belgorod Region	3,0	3,9	5,4	+2,4
Udmurtia Republic	3,2	3,7	3,8	+0,6
Orenburg Region	3,3	3,6	4,1	+0,8
The Republic of Khakassia	3,2	3,5	3,3	+0,1
Saha Republic (Yakutia)	3,3	3,5	4,4	+1,1
Komi Republic	3,1	3,4	3,7	+0,6
Tumen Region	3,0	3,4	3,8	+0,8
Sakhalin Region	3,0	3,4	3,1	+0,1
Krasnoyarsk Region	3,3	3,4	4,1	+0,8
Arhangelsk Region	2,8	3,1	3,2	+0,4
Khanty-Mansi Autonomous Area	2,6	3,1	4,7	+1,9
Kemerovo Region	2,8	3,1	3,9	+1,1
The Yamalo-Nenets Autonomous Area	2,8	3	4,1	+1,3
Chukotka Autonomous Area	1,9	2	2,2	+0,3
Average in Russian Federation	3,6	3,9	4,1	+0,5

Educational and scientific organizations and innovation enterprises are the heart of the regional innovation system [13].

During the past few years, there has been a tendency in Russia and in its regions to modernize the system of higher education, based on the results of assessing the effectiveness of higher education institutions activity. The aim of such modernization is to consolidate, reorganize or even close any inefficient branches. The aim of such modernization in Kemerovo region is the formation of a more precise structure of the higher educational institutions network in the near future [14].

The institutions that support, stimulate and regulate the processes of innovation, accumulation and dissemination of knowledge are an integral part of the RIS of the Kemerovo region.

The current structure of higher professional education in the Kemerovo region does not meet the criteria of effectiveness. The most significant problems that are typical for each of the higher education institutions are:

- duplication of educational programs;
- deficiency of scientific and pedagogical staff;
- insufficient financing of research work (R&D) and low scientific and innovative activity;
- imbalance between the graduates and the needs of the labor market [15].

As of the end of 2017, 25699 students were trained on a budgetary basis [16]. 4,625 billion rubles (0,46 % GRP) from federal budget are spent on training them annually. Experts' assessments show that from 30 to 70% of graduates do not work according to their specialty in the future. They join the ranks

of unemployed citizens and turn to the employment service. In such a situation, the region's loss is from 0.14% to 0.33% of GRP.

Financing of the employment service and retraining centers is carried out at the expense of the regional budget. For example, 5362 people were sent for retraining in 2017 [17]. These people already received higher education at the expense of the federal budget. The average cost of retraining one person is about 35-70 thousand rubles. These sums are paid from the regional budget. It is easy to calculate the loss of the region's economy, due to the costs of retraining people who have already received education on a budgetary basis. In 2017 it amounted to 187.1 to 374.2 million rubles. Thus, the total damage to the Kemerovo Region from the non-use of higher education obtained by graduates amounted to 1,406 to 3274 billion rubles.

The analysis of the process of the knowledge economy formation on the example of the Kemerovo region as a resource-type region allows us to formulate the conclusions on which the strategy of regions striving to form an economy based on knowledge should be based and recommendations for the further development of higher professional education system.

Conclusions:

- the formation of the knowledge economy is impossible without ensuring the ecological well-being of the region, creating favorable conditions for life and development of the person who is the goal and the main productive force of such an economy [18];
- the shortage of highly qualified personnel is one of the bottlenecks in the resource-producing regions in the development of the knowledge economy. Therefore it is necessary both to increase the coverage of the population by education and to improve the quality of education;
- for significant increase of the regional innovation system efficiency, it is necessary to increase the financing of the science sector (the share in GRP), and also to create a developed educational infrastructure capable of ensuring sustainable expanded reproduction of the highest qualified personnel [19].

2. Recommendations

- To implement educational programs in specialized universities on the formation of the knowledge economy in resource-producing regions;
 - To create research and educational centers for knowledge management in specialized universities;
 - To conduct a series of diagnostic seminars and questionnaires of representatives of different social groups in order to determine the appearance of Kuzbass as a region of the future;
 - To develop together with the largest companies in the region and implement in the educational process programs that are adapted to work at manufacturing enterprises of the Kemerovo region;
 - To participate in and conduct regional, all-Russian and international conferences and forums on the problems of knowledge economy;
 - To develop an initiative project "Kuzbass – region of knowledge" and create for it an information and technological complex of the knowledge base.

Thus, the study concluded that there is a specific set of factors constraining innovative development and creating unfavorable conditions for the development of the knowledge economy in the resource-type regions. They are the following:

- a weaker susceptibility to innovation due to the specifics structure of the regional economy;
- a lower demand for scientific development and highly skilled personnel;
- a lower quality of life, contributing to the outflow of bearers of an intellectual resource;
- a more acute shortage of financial resources associated with the uneven distribution of financial revenues from the extraction of raw materials;
- a weaker institutional framework for innovative development;
- a lack of an effective industrial policy and management system for innovative development of regions.

The analysis of the potential and barriers to the formation of the knowledge economy in the

Kemerovo region allowed to do the following conclusions. On the one hand, the development of the knowledge economy in the Kemerovo region involves the need to overcome many obstacles.

The specialization in the extraction of minerals, which did not form the demand for innovation and highly skilled labor and thus suppressed the growth of high-tech industries was the trend of socio-economic development of Kuzbass during the long period of time. On the other hand, the development of the region is heavily influenced by subjective factors. One of them is the regional policy pursued in the Kemerovo region. The development of the knowledge economy in the resource-type region largely depends from the actions of the regional government bodies. The Kemerovo region has a significant industrial potential in the coal and chemical industries, in non-ferrous and ferrous metallurgy. The sufficiently high potential of machine-building and construction complexes can also be restored provided that an adequate industrial policy. Further development and modernization of the educational potential of the Kemerovo region also require state support [20].

Practical implementation of the proposed recommendations will allow to achieve high quality of life of the population of the resource-type region and create a sustainable economic system in it. The man who creates, disseminates and applies scientific knowledge, his all-round development in harmony with nature, society and the state will be the main productive force of such a system.

3. References

- [1] Machlup F 1966 The Production and Distribution of Knowledge in the United States (Moscow)
- [2] Bazylev N 2010 Globalization and the "new economy" (the relationship of concepts) *Globalistics* **1**
- [3] Ivanov S 2011 Theoretical Foundations of Knowledge Economy Formation *Socio-economic phenomena and processes* **8**(030) 85-91
- [4] Zaytseva A, Sagdeeva L, Anisimova I 2016 Structural restructuring of the economy as the main direction of development of the old industrial region (by the example of the Kemerovo region) Competitiveness in the global world *Economics, science, technology* **6** 96-100
- [5] Jernov E 2013 Formation of the knowledge economy in the resourcing region: on the base of Kemerovo region (Kemerovo)
- [6] Fomina A 2014 Management of the development of high-tech enterprises of high technology industries *Creative economics*
- [7] Abdullin A, Farraketdinova R 2013 Methods for assessing the potential of science and its staff *SCIENCE* **4** <https://naukovedenie.ru/PDF/20evn413.pdf>
- [8] Lavrova N The knowledge economy and determining factors *Vestnik Saratov GSEU* <https://cyberleninka.ru/article/v/ekonomika-znaniy-i-factory-ee-opredelyayuschie>
- [9] Gavrilova I The concept and characteristics of the knowledge economy, the necessary conditions for its formation *Young Scientist* <https://moluch.ru/archive/114/29877/>
- [10] Igumnov O 2016 Knowledge economy: problems of formation and development *Stage: economic theory, analysis, practice* **5** 113-122
- [11] Agafonov F, Kalinina O, Brel O Technological convergence and innovative development of natural resource economy. E3S Web of conference *EDP Sciences* <https://doi.org/10.1051/e3sconf/20171504011>
- [12] Masaikin E 2009 Concept, content and model of a regional innovation system *Creative economics* vol 3(8) 66-74
- [13] Egorova M 2009 Innovative system of the region: basic models of analysis and development trends *Vestnik KazanTU* **1** pp 233-238
- [14] Zaytseva A, Sagdeeva L Transformation of the labor market and modernization of the regional higher educational system *RUSSIAN KNOWLEDGE ECONOMY: THE CONTRIBUTION OF REGIONAL RESEARCHER* pp190-195 (Kemerovo)
- [15] Starikova L, Sagdeeva L Innovation of the regional economy as a prerequisite for the quality of human potential *Vestnik KemGU* **4-1**(52) pp 324-331
- [16] Federal State Statistics Service <http://www.gks.ru>

- [17] Federal State Statistics Service in Kemerovo region <http://kemerovostat.gks.ru>
- [18] Lebedev A, Zaytseva A 2017 Approaches to the definition of the concept of "human capital": domestic and foreign experience *Humanitarian scientific journal* **1**(6) 13-16
- [19] Jernov E 2018 Formation of the knowledge economy in the resourcing region: the role of the support university *Vestnik KemGU* **2** <http://vestnik-pses.kemsu.ru/jour/article/view/122/0>
- [20] Savintseva S 2012 Socio-economic consequences of informal employment of the population *The successes of modern natural science* **4** 86-87

Reproduced with permission of copyright owner. Further reproduction prohibited without permission.