Research on the Quality of Economic Development of Regional Innovation Systems, Taking into Account Human Potential

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Keywords: Innovation, Regional Economy, Human Potential, Regional Innovation Systems.

Abstract: The high quality of the economic development of the region allows increasing the efficiency of public production: for this, the cost of productive labor and means of production deceases per unit of regional income, and economic development improvement, the role of scientific and technological progress of the quality of products increases. These economic processes lead to an empowerment in the quality of life of the population, as well as the effectiveness of social policy, and the environmental friendliness of the economic development of the region. As a result, regional innovative economic systems must be significantly modernized. The previous functioning type of extensive economic relations that developed through mining ultimately led to negative environmental consequences. "The ability to achieve a new quality of economic development in the regions is a major challenge. In order to solve it, it is necessary to overcome the high level of social differentiation, insufficient life expectancy, and prevent excessive exploitation of the environmentally friendly component of natural potential" (Management of innovative development of the region: monograph, 2008). That is why it is now a priority to find an alternative as well as more sustainable economic models that should provide conditions for improving the well-being of the population in the region and, at the same time, be sufficiently environmentally friendly. To solve this problem, it is necessary to give a clear quantitative assessment of the quality of economic development of regional innovation systems, which will provide a unified approach to the analysis of all indicators of the state of the region.

1 INTRODUCTION

Regional innovative economic systems are a dynamic set, where both the resources of a given region and the result of their use are of the most effective importance for the country's economy. Therefore, the issues of their quantitative measurement, determining the quality of their development have not been sufficiently studied. In particular, a single integrated approach to how to assess the quality of economic development of regional innovation systems has not yet been developed, including the concept of a single indicator for measuring it is controversial. This situation gives rise to a dispute over the quality of the development of the country's economy as a whole.

2 RESEARCH METHODOLOGY

The question of studying the concept of "regional innovative economic systems" is a new one. Therefore, the purpose of this work is to develop a single indicator for assessing the quality of economic development of regional innovative economic systems, which will help to reveal the economic content of this concept and develop the necessary quantitative methodology.

An accurate understanding of the problems of spatial and regional economic problems can be based on basic economic facts:

1) This is the predominance of natural mining regions;

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Nevmatulina, K., Tsvyrko, A. and Azarova, N.
Research on the Quality of Economic Development of Regional Innovation Systems, Taking into Account Human Potential.
DOI: 10.5220/0010665500003223
In *Proceedings of the 1st International Scientific Forum on Sustainable Development of Socio-economic Systems (WFSDS 2021)*, pages 165-171
ISBN: 978-989-758-597-5

2) This is the winning concentration in economic development;

3) This is the role of costs for domestic and external transport and communications.

A regional economy is a framework within which the spatial nature of economic systems can be understood. Determining the factors driving the distribution of economic activity in space, and recognizing that changing this distribution will have important consequences for people and communities - is the goal of the study. Therefore, today the most pressing area of research on regional innovative economic systems is the so-called synergy of closed-loop economics. In conclusion, the quality of economic development is determined by the functioning of economic models that are based on the principle of an innovative cycle, that is, continuous innovative development, and not on the constantly increasing extraction of natural resources. Environmental degradation and ongoing climate change demonstrate the need to dominate innovative economic models that are sustainable over the long term.

Thus, all the specifics of the regional economy can be concluded in the following issues: "what? where? why and how? ".

The first, "what?" refers to all types of economic activity: not only to production enterprises in the narrow sense of the word like farms and mines, but also to other types of enterprises, households, as well as private and public institutions. The question "where?" refers to the location of one economic activity in relation to another activity; "it includes issues of proximity, concentration, variance, and similarity or inconsistency of spatial structures, and it can be discussed either broadly, for example, between regions or at the meso-level, in terms of zones, surroundings and sites". Questions "why? and how?" belong to the competence of a scientist-economist.

The regional economy is a relatively young branch of the economy. Until recently, most economists ignored the question of "where?" finding many problems that they could deal with without giving their analysis any spatial dimension. "Geographers lacked awareness of the specifics of explanation in the categories of human behavior and institutions to explain "why?" and resorted to simple description and mapping. Urban planners were still concerned about the physical and aesthetic aspects of the idealized urban layout" (Zinovieva, Azarov, Heavenly, 2021).

This minor situation has been largely corrected over the past few decades. People who call themselves different professional labels - economists, geographers, environmentalists, city and regional planners, regional scientists and urbanists - came together to develop analytical tools and skills and apply them to some of the most pressing problems of that time.

"The study of theories of economic development is connected with the combination of the concepts of the "vicious circle of poverty" and the concept of "sustainable development". This concept of the so-called "vicious cycle of poverty" was applied in the analysis of the development of the economies of low-developed countries. According to this theory of quasi-stable equilibrium, its author, H. Leibenstein, revealed a relationship between the prospect of population growth and a possible change in certain economic conditions, which in turn ensures fluctuations in the economy due to an improvement or deterioration in per capita income "(Nureyev, 2000).

"This abstract theory focuses on the dangers caused by the decline in per capita income in the territory. Another view of the "vicious cycle of poverty" theory is that this problem is caused by the narrowness of the domestic market and insufficient resources for innovation. The theory of the "vicious circle of capital shortages" by R. Nurkes strongly links the economic backwardness of the Territory with specific institutional conditions, especially with indicators such as the low qualification of the labor force and the underdevelopment of secondary and higher education systems in terms of the level of vocational training "(Nureyev, 2000).

"As a result, a continuation of the theory of "vicious circles of poverty" was such a concept that gave the concept of the possibility of a transition to self-supporting growth, authored by the scientist W. Rostow. This concept was to justify the transition from a single traditional society to an innovative society of the Western type. In the concept of W. Rostow, economic development synonymizes the concept of a high growth rate" (Nureyev, 2000).

"In its interpretation, social and institutional changes do not seriously affect the development of the economy, and the indicator "the ratio of the level of investment to the level of growth of GNP" comes to the fore. In his opinion, a sufficiently large injection of capital resources is necessary for the successful modernization of the national economy. As a result, self-sustaining growth will begin. It is not possible to mobilize these resources on an absolutely voluntary basis. The State must therefore ensure the forced saving of the population. These savings are the result of a special monetary and fiscal policy of the State. The inefficiency of fiscal capital could be offset

by the import of monetary capital. The term "economic development" refers to profound structural changes. These changes cover completely all the main sectors of the national economy, which is called the theory of "big push"(Nureyev, 2000).

The "theory" model with two deficits "was to describe the relationship between the development of the processes of internal accumulation of monetary resources in the country and the reduction of sources of external financing. The theory of the "two-deficit model" explains "economic development" by crowding out external sources of financing by domestic ones. Replacement of imported goods with domestic ones, which will be the basis for overcoming external monetary and financial dependence" (Nureyev, 2000).

"Therefore, the main disadvantage of these concepts is that they focus on the use of a fairly limited economic factor in developing countries - capital. However, the error of these economic theories was the failure to take into account the possibilities given by the use of such a relatively excessive resource in some territories as labor"(Nureyev, 2000).

The study of the concept of "economic development" in the understanding of J. Schumpeter (Shpaltakov, 2017), determines the ability to implement such innovations in which the entrepreneur will initiate this innovation.

Considering the economic theories of Keynesians, whose research base was a change in the technical and economic parameters of the economy. However, the socio-economic prerequisites of these studies did not affect.

Neoclassical theories of economic development were based on an equilibrium combination of capital accumulation and population growth trends. These two indicators provided a combination of the development of the two-component component of the Territory's economy - agricultural and industrial sectors. W. Lewis, A. Hirschman, S. Schatz, J. Fey and G. Ranis, as founders of the theory of dualist economics, assumed that urbanization of the population, including the movement of labor resources from agriculture to industry, ensures the development of the economy as a whole. But the quality of economic development in this theory was not considered. Economist G. Murdal, who ensures the humanization of economic growth in terms of paying special attention to the means of solving social problems, criticized the main theories of growth. There was a distinction in the understanding of economic growth and development. If economic growth does not generate income growth for the majority of the population, it contributes to instability in the economy, technological stagnation, corruption and bureaucracy. Leaving aside the economic situation of the majority of the population, this economic growth did not contribute to the qualitative development of the population living in this territory. By development, this researcher understood the degree of satisfaction with the basic needs of the majority of the population (Shpaltakov, 2017).

And after some time, the time has come for the institutional approach to dominate the understanding of economic development. This approach was developed by T. Schultz, as a prominent representative of the economic school, which founded an understanding of investment in human capital. "Human capital combines all the productive qualities of workers, including the totality of knowledge, skills, motivation and mental energy. By means of preparation of the human capital for processes of production, investments into expenses for education, education, health care, prerequisites for his functioning in an effective form" are created" (Pavlova, 2011). This trend will, in the author's opinion, ensure economic development.

At the same time, special importance is attached to the formation of models of regional innovation systems through the education system and the accumulation of scientific and technical potential. According to simplified models, the regional innovation system includes: (a) organizations that produce and use knowledge; b) participants ensuring the activity of the former; c) a single sociocultural space. "Thus, the basic idea of modern concepts is that economic development should be accompanied by the corresponding synergistic development of social infrastructure, improvement of the quality of life of the population, state of ecology, improvement of the institutional basis of economic activity" (Pavlova, 2011). This conditions the quality of economic development of regional innovation systems.

3 RESULTS OF THE STUDY

The essence of regional innovation systems is a complex of organizations that provide the territory with the production of new knowledge, new professional experience, skills and skills. These industries contribute to the financial, economic, legal and information support of innovative processes in the region. The innovative potential of economic development is the basis of the regional innovation system. With the standard method of assessing the economic development of regional systems, it was

possible to determine only the level of development of production. But taking into account international trends in assessment, one can say that such an assessment is insufficient. This is due to the understanding that human capital will be the basis for the economic development of regional innovation systems. And "the development of such aspects as education, health, the state of the environment, equal opportunities in the economic sphere, personal freedom and a culture of life provides the basis for growth and further development" (Stroeva, 2021). International organizations assess the level and quality of life of the population of the economy in a particular territory according to various indicators. The competent use of statistical information allows the calculation of many indicators characterizing these processes. It is therefore necessary to assess the quality of economic development of regional innovation systems. The regional innovation system is based on the national system, in terms of copying its development trends as a subsystem element. To equalize the economic situation of regions and maximize their potential (economic, social and environmental), this assessment is based on a specific innovation strategy, unique opportunities and abilities of each regional territory. To address "the problem of such an assessment, it is necessary to identify and limit the list of indicators. These indicators can be seen as indicators of the innovative state of the region based on the functioning of the regional innovation infrastructure" (Pavlova, Pavlova, 2011).

"The integrated indicator of the functioning of the regional innovation infrastructure should be a multidimensional complex" (Stepanova, 2021), which includes the following elements:

- Costs of high-tech health care in the region;
- Level of demographic growth (fall);
- average real incomes of the population in the region;
- Environmental welfare costs;
- Level of environmental protection;
- Social component of economic well-being (level of schools, universities, institutions of secondary vocational education);
- Availability of business clusters for innovative support of regional economic development.

"Some researchers are invited to assess the following types of efficiency of the innovation system: social, economic, environmental, demographic; social and economic" (Zinovieva, Azarov, Heavenly, 2021).

The proposed algorithm for assessing the functioning of the regional innovation system consists of a list of consecutive stages.

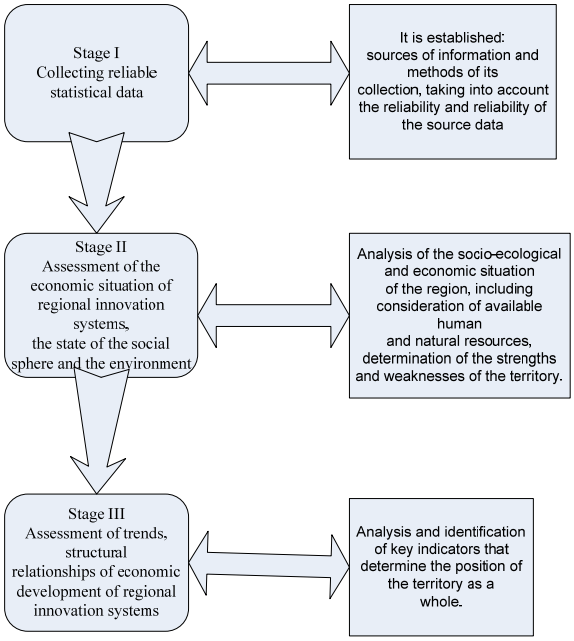

Figure 1: Algorithm for assessing the quality of economic development of regional innovation systems.

"At each stage, a certain task has been identified for solving, sources of information, ways of their collection are established, reliability and reliability of initial data are assessed, i.e. the task of collecting reliable statistical data is solved" (Stroeva, 2021).

Table 1: Indicators of analysis of innovative potential of the region.

Indicator group	Type of indicators	Source of statistical information
Level of education of the population in the region	Proportion of employees with higher and secondary education in the total population of the region	Statistics
Innovation and technical components	Share of innovative enterprises in the region according to the balance sheet	Statistics Calculation data
Financial component	Share of technological innovation costs in the region	Statistics
Scientific component	Proportion of researchers performing research and development in the region	Statistics
Environmental component	Share of waste technology development costs in the region. Sum of specific emissions and waste generation	Statistics

By highlighting the main blocks of innovation potential of the region, the main indicators for analysis can be identified.

4 DISCUSSION OF RESULTS

"An index refers to a specific construct formed by a combination of indicators. The process of constructing an index is often one way to create a new concept at the empirical level of knowledge or to replace the inaccurate concept of the theoretical level with a more accurate one. The construction of the index can be considered as a way to obtain values of a latent characteristic that is not directly measurable using certain transformations of the values of the observed characteristics (indicators)" (Pavlova, Pavlova, 2011). "An index as a construct of indicators is considered to be the empirical equivalent of its corresponding concept. The purpose of introducing indicators and indices is to assess the situation (state, situation) in some areas of research, on the basis of which a forecast of possible developments should be given and recommendations to ensure the achievement of the development goals of the systems under consideration" (Stepanova, 2021). The algorithm for constructing the index reflecting the quality of economic development of regional innovation systems takes into account the methodology for calculating the "human development index", which includes the arithmetic mean of three private indices:

- "index of the scientific component, based on the share of scientists performing scientific research and development in the region" (Carrot, 2020);
- The education index, measured as the aggregate index of the proportion of employees with higher and secondary education in the total population of the region;
- Index of knowledge-intensive GDP per capita, taking into account the share of innovative enterprises in the total number of enterprises and the share of costs of these enterprises for technological innovations in the regional economy;
- Eco-innovation index, which includes the cost of developing waste management technologies in the region and the sum of specific emissions and waste generation.

The calculations use unified minimum and maximum values of statistical indicators: from 0 and up to 100%.

Each private index is calculated using the formula:

$$I_i = \frac{x_i - x_{i\,\min}}{x_{i\,\max} - x_{i\,\min}} \quad (1)$$

"A number of Russian researchers note regional innovation systems specific to the index, taking into account human potential, such as the insufficient reasoning of the accepted limits for changing baseline indicators, and the almost free substitution of baseline indicators. The proposed integral indicator should include three blocks: economic, qualitative and social, environmental. Private indicators are built on the basis of block data, which in turn consist of normalized values of individual indicators" (Astakhin, Tretyakova, 2019). "When building a consolidated index of the quality of economic development of regional innovation systems, it is necessary to proceed from the real possibility of obtaining certain indicators necessary for calculations. The statistical indicators included in the index should meet the following requirements: representativeness, according to which all the main indicators of the information block under consideration should be presented in this list; information accessibility, according to which the indicators involved in further analysis should be available for their statistical registration" (Zinoveva, Yakovlev, Pecherskaya, 2019).

"Therefore, they must be included in the nomenclature of official statistical indicators, or calculated from the values of the latter; Information reliability, according to which the statistics and private indicators used should adequately reflect the state of the economic development dimension under analysis. The method of rationing is based on the determination of the "most favorable" and "least favorable" values of each indicator according to the totality of territories" (Bahur, Nebesnaya, Azarova, 2020). "The formula for rationing the values of indicators that have a positive impact on the quality of economic development of regional innovation systems has the form" (Bahur, Nebesnaya, Azarova, 2020):

$$y_{norm} = \frac{y_{fact} - y_{least}}{y_{most} - y_{least}} \quad (2)$$

for indicators that have a negative effect, the formula is transformed as follows:

$$y_{norm} = \frac{y_{most.} - y_{fact.}}{y_{most} - y_{least.}} \quad (3)$$

where y_{norm} is the normalized value of the indicator;

Y_{fact} - actual value of the indicator;

Y_{most} - the most favorable value of the indicator;

Y_{least} - the least favorable value of the indicator.

"This approach allows the assessment procedure to take into account the positive or negative impact of a factor on the quality of economic development of regional innovation systems, taking into account the impact on human development, based on the meaning or nature of the indicator related to it" (Yakovleva, et al., 2018). It is proposed to calculate indicators for each of the areas (educational, health, cultural and social) according to the arithmetic average formula:

$$I_j = \frac{\sum_{i=1}^{n} y_i}{n} \quad (4)$$

where it is the development index j of the sphere.

"Further analysis and comparison of the obtained integral assessments of the state of economic development of regional innovation systems, their graphical representation and interpretation are carried out. The integral indicator for assessing the quality of economic development of regional innovation systems (I) is proposed to be calculated using the geometric mean formula" (Yakovleva, et al., 2018):

$$I = \sqrt[3]{I_1^{\omega_1} \times I_2^{\omega} \times I_3^{\omega_3}} \quad (5)$$

where ωj - weight coefficients, and their sum it is equal to 1.

"The implementation of the proposed evaluation system, taking into account the algorithm, will allow the researcher to quantify the quality of economic development of regional innovation systems, taking into account the impact on the formation of human potential, to conduct a comparative analysis in the context of the subjects of the Russian Federation. Complex approach ensures validity of study results" (Yakovleva, et al., 2018).

5 CONCLUSION

In this regard, it is interesting to analyse innovative economic systems in the following areas: as a channel for technology diffusion, as a competitive environment and as export opportunities.

There are three possible channels for technology diffusion: import, direct investment and technology trade. As for imports, the effect of increasing the domestic technological level and productivity through the import of high-quality foreign goods was recorded. Direct investment can also increase productivity in both the initial and subsequent stages of the supply chain. In addition to the side effect through the supply chain, also point to the side effect of technologies in the same industry. The last is technology trading. Trade in technology in the form of licensing is considered particularly important for innovation in the chemical and pharmaceutical fields. It can also be said that technical guidance and training of workers can help to accelerate the distribution of these goods.

Competitive environment, innovative economic systems as an export opportunity. Free trade is believed to increase competition. It was pointed out that the impact of competition on innovation was to ensure discipline in companies and improve efficiency, but it was also hypothesized that investment in R & D would not be possible due to reduced profits from competition. They are not incompatible with each other, and there are hypotheses and empirical studies that determine which effect is better depending on the degree of fierce competition and the level of technology. As a management strategy, there are times when we introduce inexpensive innovations to increase the efficiency of companies and management in conditions of competition and pressure, and there are times when we carefully differentiate products through innovation and avoid competition.

The third point is the relationship between export and innovation. It is usually said that export companies are more productive, but as for causation, economic discussions until the early 2000s said that high-performance companies would enter the import market. However, recent empirical studies have shown that, for example, the expansion of export opportunities has increased the motivation for innovation, which together leads to increased productivity.

Finally, the linkage between trade and innovation through the liberalization of economic systems is an important issue. Free trade and the investment environment are in themselves a framework for promoting innovation, and it can be said that interaction with a wider range of policy areas is also important to be linked to real innovation. In this regard, it is important to train absorption capacity in a broad sense. This also means the ability to absorb and learn technology, focusing on individuals, but also includes broader policy contexts: stable macroeconomics, market regulation.

In practice, the quality of economic development of regional innovation systems reflects many indicators. Therefore, solving the problem of quantifying these indicators allows us to determine the prospects of this study.

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