

Modeling of Regional Management of Innovation Activity: Personnel Policy, Financial and Credit and Foreign Economic Activity

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Summary

The article proposes a method of modeling a comprehensive indicator for evaluating the effectiveness of regional management of innovation activity. This will make it possible to assess the effectiveness of personnel, financial and credit and foreign economic activity of the regions from the standpoint of an integrated approach. The modeling technique is proposed to be carried out using the tools of taxonomic analysis and the calculation of a complex indicator of the effectiveness of the innovation activity management.

Key words:

regional management, innovation activity, personnel policy, financial and credit activity, foreign economic policy

1. Introduction

The issue of assessing the effectiveness of regional management of innovation activity in the context of determining the effectiveness of personnel, financial, credit and foreign economic policies has always been in the whirlpool of scientific thought. A number of famous scientists (Hnatenko, 2020; Gryshchenko et al., 2021; Zherdetska et al., 2021; Semenov et al., 2021; Lozhachevska et al., 2021; Brockova et al., 2021;) proposed a methodology for calculating the effectiveness of innovation in the context of macro-, micro- and meso-levels. Janssen and Ittersum (2007) proposed a method for evaluating farm innovations and defined the conditions for the development of bioeconomic farms. The article by Chen and Guan (2011) proposed models of innovation management and concretized the further effective development of Chinese high-tech industries. Researchers Lee et al. (2016) obtained a model for evaluating the effectiveness of business innovations and identified the impact of human capital on improving the productivity of the restaurant. Luz et al. (2015) modeled the product life cycle in the context of innovation development of the industry. The obtained model allowed determining the

points of the relationship between the life cycle of the industry and innovation. Bodlaj et al. (2020) investigated how innovation activities affect the sustainable development of small and medium-sized businesses in Central and Eastern Europe. Aldieri et al. (2021) proposed a model for assessing the efficiency of production in the United States and Europe due to the expansion of channels for the transfer of technological innovation in the agricultural sector. Without diminishing the results of these scientists, we note the need to further deepen the methodology for modeling a comprehensive indicator of regional management of innovation in the context of personnel policy, financial and credit and foreign economic activity.

2. Methodology and Results

We suggest modeling of regional management of innovation activity of personnel, financial and credit and foreign economic activity to carry out with use of tools of taxonomic estimation. In particular, the procedure for implementing the simulation contains the following calculations (Table 1).

Table 1: The procedure for modeling a complex indicator for assessing the effectiveness of regional management of innovation activity

Calculation	Formula	Values of indicators
Observation matrices	$X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1r} & \dots & x_{1j} \\ x_{21} & x_{22} & \dots & x_{2r} & \dots & x_{2j} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ x_{n1} & x_{n2} & \dots & x_{nr} & \dots & x_{nj} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \dots & x_{mr} & \dots & x_{mj} \end{bmatrix}$	where m – a set of objects, according to which the modeling of regional management of innovation activity is carried out; j – a set of proposed factors for managing innovation activity; x_{nr} – indicator of the innovation activity management factor r for an individual object n
Data standardization	$H_{nr} = \frac{x_{nr} - \bar{x}_r}{\delta_r}; \text{ where}$ $\bar{x}_r = \frac{1}{m} \sum_{i=1}^m x_{ir}$ $\delta_r = \left[\frac{1}{m} \sum_{i=1}^m (x_{ir} - \bar{x}_r)^2 \right]^{\frac{1}{2}}$	where δ_r – standard deviation from the standard; x_{ir} – the value of the innovation activity management factor r for the object i ; \bar{x}_r – the average value of the factor of innovation activity management r ; H_{nr} – the level of standardization of the management factor of innovation activity r for the object n
Stimulants and destimulants	$H_{0q} = \max H_{iq}, \text{ if } q \in S,$ $H_{0q} = \min H_{iq}, \text{ if } q \notin S \ (q = 1, 2, \dots, j)$	where S – a set of stimulants that positively affect the innovation activity of the region; q – the value of the input feature of innovation activity; j – multiple selected factors of innovation activity; H_{0q} – a standard feature q . H_{iq} – the result of the value standardization of the innovation activity factor q for the object i
Euclidean distance	$Z_{no} = \sqrt{\sum_{n=1}^m (z_{nr} - z_{or})^2}$	where Z_{no} – Euclidean distance between separately defined indicators in space and the reference vector; z_{nr} – the result of standardization of the r -th factor of the n -th object of observation; z_{or} – the result of standardization of the r -th factor in the standard; m – a set of objects of observation
The total distance between the values of the factors and the standard	$Z_o = \bar{Z}_o + 2D_o$	where D_o – standard deviation
Average distance	$\bar{Z}_o = \frac{1}{m} \sum_{n=1}^m Z_{no}$	where m – a set of objects of observation; Z_{no} – Euclidean distance between separately defined indicators in space and the reference vector
Standard deviation	$D_o = \sqrt{\frac{1}{m} \sum (Z_{no} - \bar{Z}_o)^2}$	where \bar{Z}_o – the average distance between the values of the factors and the reference vector
Deviation of the vector of the n -th object from the standard	$dv_n = \frac{Z_{no}}{Z_o}$	
Comprehensive indicator for evaluating the effectiveness of regional management of innovation activity	$T_n = 1 - dv_n$	where dv_n – deviation of the vector of the n -th object from the standard

(Source: adapted by the authors using Hnatenko’s theory)

Let us analyze in more detail the obtained results of managing the innovation activity of personnel, financial and credit and foreign economic activity. The personnel component occupies a decisive place in the development of innovation activity and the formation of small or medium-sized businesses (HNATENKO, 2018). Human resource is a concept that can be explored as a separate category in economic theory. Very often, human resources are defined as a structural part of the labor market, which is inherent in a particular area. In addition, innovation is managed with the direct participation of staff, managers or executives. The calculations performed in accordance with the methodology shown in Table 1 allow us to observe the current state of personnel policy in a particular region of Ukraine.

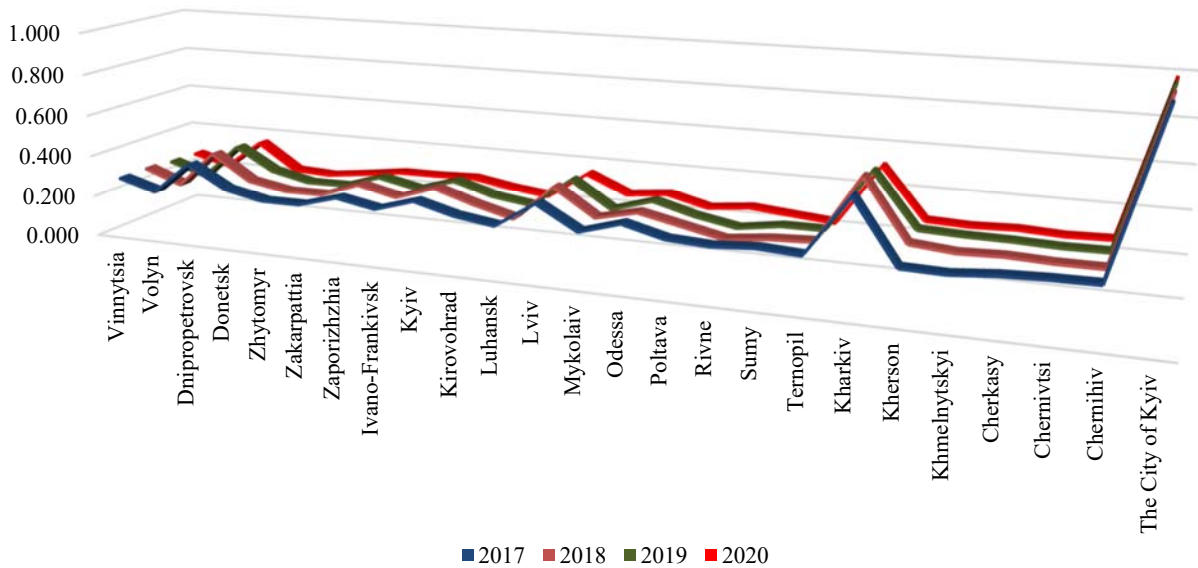


Fig. 1 Results of personnel policy assessment (Source: calculated by the authors)

The results of determining the state of personnel policy for the regions that have occupied the lowest positions in the studied indicator require the introduction of a set of administrative actions that will stimulate innovation activity. Among such actions it is necessary to distinguish the following:

- improving the level of education, medical care and social guarantees for the population;

- increasing interaction between public authorities, infrastructure elements and other local economic agents;
- attracting foreign labor resources with a high level of education;
- organization of international and state conferences, symposia, exhibitions, fairs, etc.

The results of assessing the state of financial and credit activities are shown in Fig. 2.

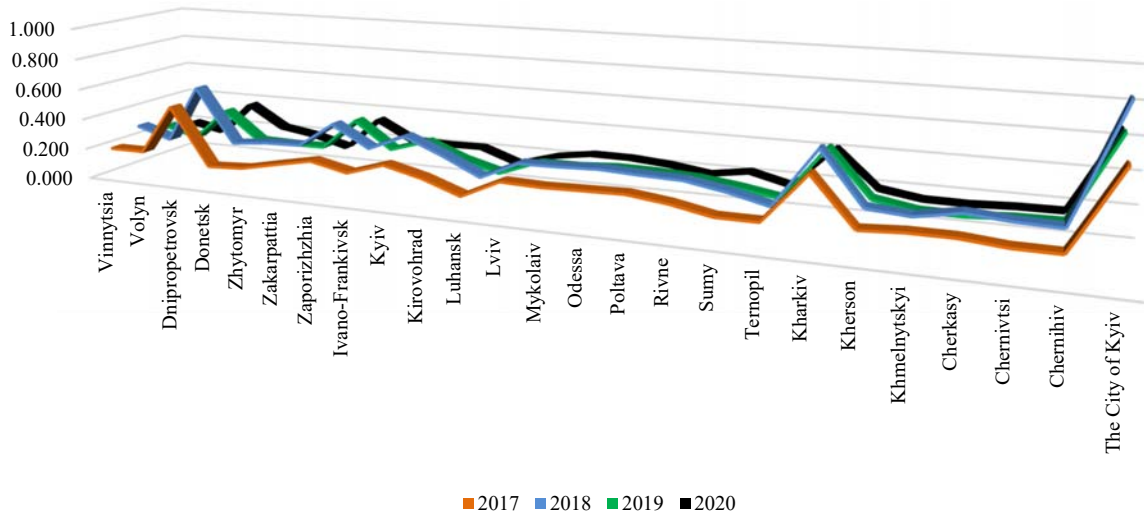


Fig. 2 The results of assessing the state of financial and credit activities (Source: calculated by the authors)

It should be noted that the framework of effective innovation is the availability of market stakeholders to financial sources that will promote research in all areas of the national economy and stimulate public involvement in innovation. According to the results of the survey of business stakeholders by the State Statistics Service of Ukraine, the largest number of respondents pointed out the lack of funds regarding the reasons that hindered the implementation of innovation activities. If the area where active innovation development is planned is unattractive for investment, the quality of innovation policy management will be ineffective. Therefore, in order to increase financial and credit activities, the following is necessary:

- covering the costs of entrepreneurs for research and development;
- providing soft loans for startups;
- transparency of tenders and fair distribution of public funds aimed at supporting innovation entrepreneurship between regions.

Due to the lack of experience in the national economy in the formation of public funds, strategies, mechanisms for financial policy in the field of innovation, especially in crisis, the Ukrainian authorities face extremely difficult problems of developing a national financing program, which requires the experience of other effective its development of partner countries. The difficulty in developing funding programs also arises due to the fact that innovation activities are diverse in type, respectively; innovation enterprises differ from each other. The need to attract different amounts of initial costs of start-up capital depends on the type of innovation, the duration of their development period and the market entry process. In this process of development there are key stages at which it is vital for the company to have sufficient funding for research and development, development of the concept of a prototype product prototype, verification of parameters of compliance with market conditions, risk minimization and start production. There is a need to attract all the resource and regulatory potential that could be used for financial support of innovation enterprises through comprehensive tax incentives for participants in the innovation process (public, private, scientific organizations, credit and financial institutions, etc.).

The results of assessing the state of foreign economic activity are shown in Fig. 3.

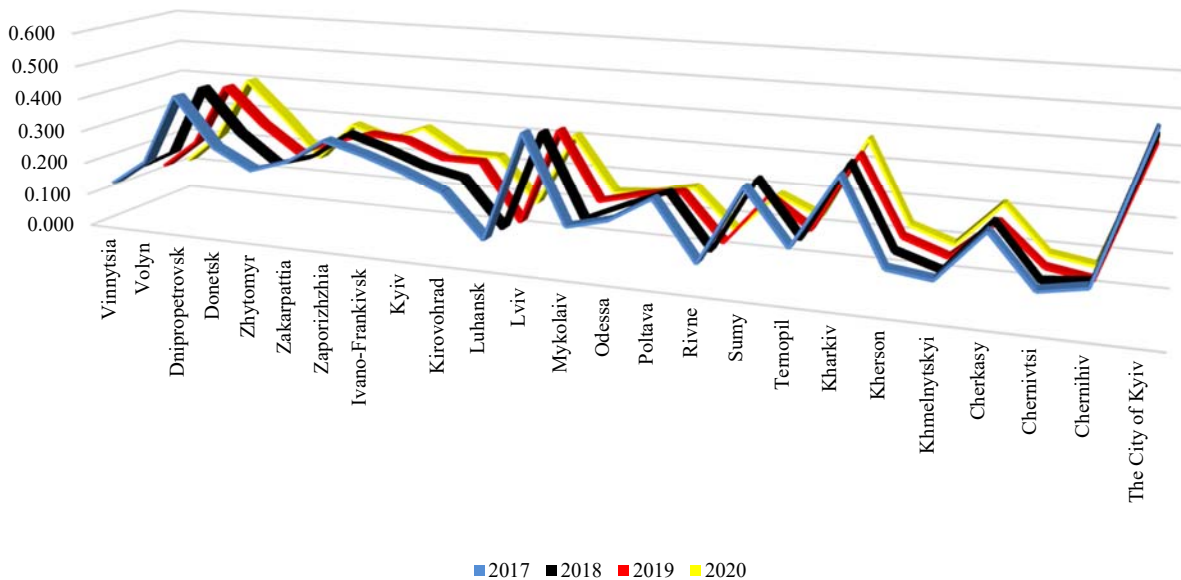


Fig. 3 The results of assessing the state of foreign economic activity (Source: calculated by the authors)

Foreign economic activity plays a key role in the context of supporting the innovation development of regions. Therefore, public administration should be aimed at the most effective policy to support domestic producers and the distribution of domestic products in foreign markets. The main goal of state policy should be to stimulate innovative exports and import substitution programs. It is the growing global competition that dictates the need to prioritize the export of innovative high-tech products (the latest technologies of knowledge-intensive production), which is the most competitive in the world due to its inherent specific properties. Thus, in determining the state priorities for business development, conditions should be created for the implementation of effective export activities by domestic producers: to provide targeted financial support to export-oriented businesses working in the field of innovation; to improve at the legislative level the system of classifying products as high-tech, to facilitate the simplification of its certification for the real sector of the economy, to exempt producers of these products from export taxes; to provide state assistance to entrepreneurs in international networking, which will facilitate the search for the necessary technological and financial partners for the sale of goods or services; to involve the most famous domestic universities and research centers in the creation of innovations and assistance to economic entities in this direction in order to make possible the transfer of new technologies and the introduction of theoretical knowledge into world practice.

The general results of management of innovation activity of personnel, financial and credit and foreign economic activity are shown in Fig. 4.

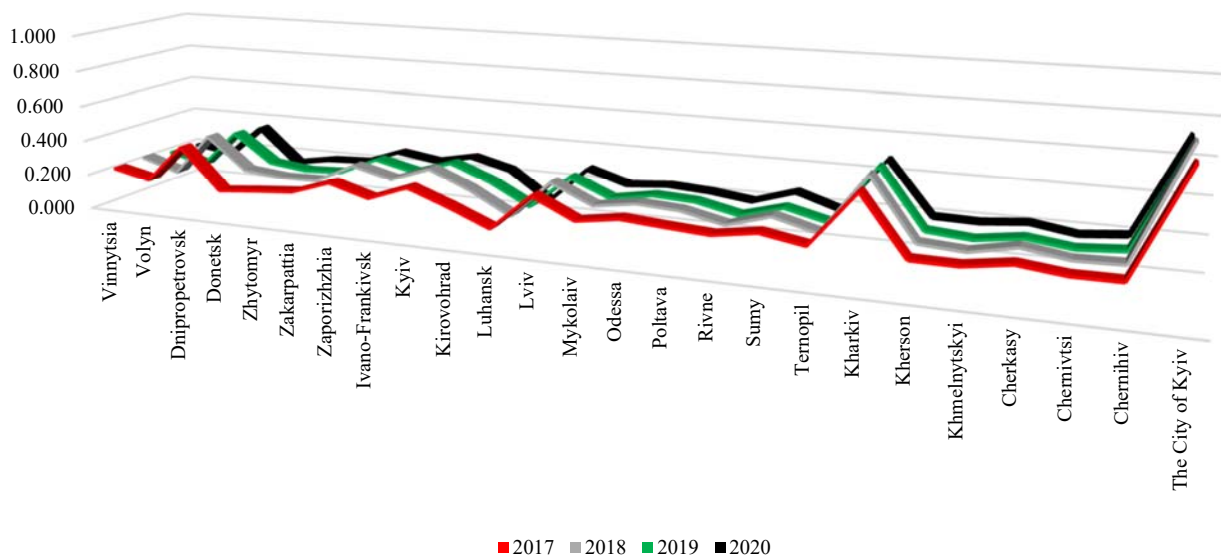


Fig. 4. General results of the assessment of regional management of innovation activity in the field of management, financial and credit and foreign economic activity (Source: calculated by the authors)

Thus, the modeling of regional management of innovation activity in the context of determining the effectiveness of personnel policy, financial and credit and foreign economic activity should be carried out using the tools of taxonomic analysis. In particular, in the process of this modeling it is advisable to calculate: the observation matrix; data standardization; selection of stimulants and destimulants; Euclidean distance; the distance between the value of the factors and the standard; medium distance; standard deviation; deviation of the object vector from the standard; the general indicator of result of management of innovation activity in the context of development of personnel, financial and credit and foreign economic activity.

3. Conclusions

Thus, using the tools of taxonomic evaluation, we proposed modeling the evaluation of regional management of innovation activity to determine the effectiveness of personnel policy, financial and credit and foreign economic activity. The results of the calculation of this modeling allowed determining the regions of leaders and outsiders by the level of efficiency of innovation activity management. Thus, the city of Kyiv and Kharkiv oblast are among the leading regions. In Luhansk, Ivano-Frankivsk and Donetsk oblasts, there is a need to review the state policy on innovation management in terms of developing measures to support personnel, financial and credit and foreign economic policy.

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