

Sustainable development of regions: Modeling the management of economic security of innovative entrepreneurship



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ABSTRACT

The purpose of this study is to develop a methodology for assessing the level of economic security of innovative enterprises based on the use of taxonomic analysis of the main indicators of their institutional support for the optimal organization of management and forecasting the economic development of the regions of their operation. The method proposed in the article consists in assessing the system of indicators of institutional support for innovative entrepreneurship within the framework of the Institute of Human Capital, the Institute of Financial and Credit Component, the Institute for the Implementation of Innovations in Industry, the Institute of Export Activities, the Institute of Intellectual Property, the Institute of Infrastructure Support, the Institute of Regulatory and Legal Support, the Institute of Public-Private Partnership and Mediation, the Institute of Information Support. The advantage of this technique over the methods for assessing economic security proposed in other scientific works is that the summary assessment indicator is universal and its interpretation makes it possible to identify the relationship between the main integrated indicators for all regions of the studied country, taking into account the unevenness of their economic development, as well as to analyze the question of the causal nature of the transformation of the institutional environment and its consequent. The practical significance of systematized indicators of institutional support, influencing the modeling of economic security management of innovative entrepreneurship, is that they can be used in forecasting the economic development of regions of the country and developing appropriate measures to regulate this process.

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1. Introduction

The new realities of innovative entrepreneurship functioning, due to the significant complication of the business environment due to quarantine restrictions due to the COVID-19 pandemic, negatively affected regional economic development in many countries of the world due to the decrease in

the economic efficiency of the activities of these economic entities. After all, it is the successfully operating innovative enterprises that contribute to the formation of a competitive environment in the regions, react in a mobile manner to changes in the consumer market, have a positive effect on the employment of the population, stimulate scientific and technological progress and form the preconditions for the transition of the country's economy to a new technological structure. Innovative entrepreneurship changes and sets a further evolutionary trend in the development of the regional economy and the national economy as a whole due to the innovative and progressive organization of its economic activity. This

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determines the relevance of analyzing the conditions for the development of entrepreneurship in an innovative economy and determining its contribution to the sustainable development of the country's regions.

An important aspect in formulating the methodology of neo-innovation development of measures to regulate the development of innovative enterprises in order to optimize the management of their economic security is to identify the main trends and initial prerequisites for the institutional support of entrepreneurship in the conditions of its functioning in the economic environment of each specific region of the country (Semenov et al., 2021). At the same time, the study of the peculiarities of the entrepreneurship development in the innovative economy should not be carried out in fragments, since external threats, internal troubles; frequent changes in regulatory legal acts in many countries of the world affect the functioning of entrepreneurship, constantly changing the trend of its development. Existing proposals to increase the revitalization of innovative enterprises in a particular country require a revision of the conditions for the modern development of the corresponding national economy.

2. Literature review

The works of many scientists are devoted to the study of the specifics of managing the economic security of innovative enterprises, as well as the functioning influence of these economic entities on the sustainable development of regions of the countries of the world (Yu et al., 2016; Wu et al., 2017). Thus, Miao et al. (2020), taking into account the main factors of environmental impact, built an economic and mathematical model for optimizing efficiency management at enterprises of the coal industry in China.

Ferjencik (2020) considered the practical aspects of managing economic security at enterprises of the processing industry. Wang et al. (2021) examined the importance of the economic security of energy enterprises for the development of regions of their operation and built a system of indicators for assessing regional economic security. Koshkina and Sharamko (2015) considered the use of internal controls to assess the economic security of research projects of innovative enterprises.

The only drawback in these scientific articles is that the proposed methods of assessing the economic security of enterprises are not universal and can be used in enterprises only in certain industries. At the same time, for the analysis of enterprises operating in different sectors of the economy, it will be necessary to form additional systems of indicators, which, in turn, will significantly complicate and slow down the process of calculating and interpreting the results of assessing economic security.

In this regard, the formation of a system of universal assessment indicators for innovative

enterprises of all sectors of the economy for the simultaneous analysis of a large array of numerical data, and as a consequence of optimizing the assessment process as a whole, is of particular relevance.

The scientific work by Pineda and Cerón (2019) conducted a comparative analysis of the levels of sustainability of nine sub-regions of Colombia using consolidated assessment indices. Chopin et al. (2017) proposed a methodical approach to assessing the contribution of agricultural enterprises and the level of their economic security in the sustainable development of the regions of Guadeloupe. Kinnear and Ogden (2014) examined the importance of developing innovative strategies for businesses in Australia's "resource regions" to improve their economic security and the stability of the regions in which they operate. RathaKrishnan and Santhy (2002) provided the analysis of the transnational corporations' activities impact, as well as the level of economic security on them on the development of regions in India. In the work by Diaz (2011), the process of planning strategies for sustainable development of regions taking into account the level of economic stability of enterprises operating in these regions was considered.

In the scientific paper, Pan et al. (2021) analyzed the differences in the development of 31 regions of China, due to the functioning of agricultural enterprises in the studied territories with different levels of economic security. The research of these authors in the analysis does not take into account the uneven economic development of different regions of the country, which directly affects the efficiency of business entities, creating a specific environment for their operation and forming the main external factors of negative and positive impact. Therefore, in order to obtain data on the level of economic security of innovative enterprises engaged in various economic activities in different regions of the country, it is necessary to normalize the numerical values of indicators of the level of their economic security for their further comparison with each other, taking into account the uneven economic development of the regions of their operation.

Paying tribute to the above scientific works, it is worth noting that there is no unified approach in the authors' data to determine the set of optimal criteria for assessing the level of economic security of innovative enterprises, regardless of their area of business. The above-mentioned actualizes further research in the direction of optimizing the management of the economic security of enterprises to ensure the sustainable development of the regions of their functioning. In this regard, the purpose of the article is to develop a methodology for assessing the level of economic security of innovative enterprises based on the use of taxonomic analysis of the main indicators of their institutional support for the optimal organization of management and forecasting the economic development of the regions of their operation.

3. Methodology

Methodological approaches to the integrated assessment of the level of economic security of entrepreneurship in the innovative economy and the effectiveness of its management by managers of economic entities are characterized by complications manifested in changing institutions, strategic guidelines of public administration, and instability of exogenous and endogenous factors of innovative development (Mykhalchenko, 2018; Barczyk et al., 2019). At the same time, one of the indicators that form a certain level of economic security in the enterprise of any sphere of management is its institutional support. It should be borne in mind that the structure of the institutional environment of innovative entrepreneurship reflects the close connection of structural elements, where the central role weight falls on the object-subject institutional composition of the participants (Samborskyi et al., 2020; Hnatenko et al., 2020a). In this context, the regional approach is especially important in assessing such an environment, the use of which will allow taking into account the uneven socio-economic, geographical, and resource conditions of development of the regions of Ukraine when determining target programs, strategies, or distribution of state support. In order to determine the appropriate procedure for assessing the institutional environment, it is necessary to take certain actions, including the solution of the following tasks:

1. Identification in the scientific world of existing, most common, and adapted to the conditions of the national institutional environment methodologies for its evaluation.
2. Consideration of the information base or available static sources that will attract a wide and sufficient range of indicators to assess the phenomenon under study.
3. Development of a methodology for calculating primary indicators-complementation, which involves determining their own methodology or adaptation of existing methods of evaluation of indicators selected for analysis. At the same time, preference should usually be given to mathematical and statistical methods, which make it possible to take into account the qualitative and quantitative indicators of the institutional environment and assess changes in the transformation of the environment.
4. Systematization of the necessary indicators for assessing the institutional environment of innovative entrepreneurship (instrumental indifference), which most fully specify the priorities of the innovative development of the region for the sectoral, territorial, structural, temporal orientation. The main requirement for these indicators is the display of relevant and accessible information necessary for the methodological support of the assessment processes.

5. Interpretation of the summary indicator and assessment of results, which allows to identify the relationship between the main integrated indicators for the regions of the studied country and to analyze the issue of the causal nature of the transformation of the institutional environment and its consequences.

The use of a systematic approach in this study will allow to properly structure and establish the relationship between the elements and factors of regional development, as well as to identify "bottlenecks" in the development of the institutional environment of innovative enterprises in these regions. At the same time, in combination with the system approach, only synergetics can comprehensively describe the complex systems of economic security of enterprises, the level of which, in turn, affects the sustainable development of the regions of their operation (Hnatenko, 2020; Zos-Kior et al., 2021). The synergy of the institutional environment appears as a growing effect of the combined efforts of the participants, in which the overall efficiency significantly exceeds each of the separate effects and appears in the form of the well-known rule "2+2=5"(Eq. 1):

$$E_s > E_1 + E_2 \dots E_n \quad (1)$$

Moreover, the difference between the effects forms a general synergistic effect (Eq. 2):

$$E_{se} = E_s - (E_1 + E_2 \dots E_n) \quad (2)$$

Within the combination of synergetic and systemic methodological approaches, it is also possible to take into account the macro level, in which the institutional environment is considered as complex multiple objects and multilevel organism, and the micro-level, which takes into account the activities of businesses that reflexively respond to changes in the environment. At the same time, the main task that needs to be solved when assessing the economic security of innovative entrepreneurship on the basis of indicators of its institutional support is the choice of methods for calculating the collected. At this stage, it is necessary to determine the methodology that will most fully disclose the chosen system-synergetic methodological approach (Hnatenko et al., 2020b). Therefore, it must be: Authentic, congruent, valid, and targeted. In general, the task of developing this technique should meet the following requirements:

- The availability of a reliable system of indicators;
- The universality of the technique that allows to apply it in different economic systems;
- In formativeness and comprehensibility of the methodology;
- The possibility of building on its basis a strategy for further management actions.

We believe that taking into account the selected assessment methodology, one should take into account not only the official statistical indicators but also the indicators obtained as a result of the application of the expert-qualimetric assessment method obtained as a result of the questionnaire, which will avoid the fragmentation of the analysis. In this context, it is advisable to involve the stakeholders of the institutional environment—government officials, private entrepreneurs, members of public organizations, who will provide their explanations and answers to the previously developed questions in the questionnaire. This procedure is necessary to identify the factors and the degree of influence of institutions on the repetitive behavior of economic agents or individual stakeholders. This will reveal the parameters of the order, which are not reflected in the official information sources, but which are subject to the complex behavior of the elements of the innovation system of the region. That is, according to the synergetic approach, the behavior of the parameters of informal institutions is described, and thus "significant effective information compression" is obtained, which determines the innovation capacity of the region, institutional receptivity, and the reserve for expanding the institutional context of the regional innovation system.

After obtaining the results, it is necessary to calculate the integral indicator for assessing the economic security of entrepreneurship, taking into account the selected heterogeneous statistical indicators. For this, we consider it expedient to use the method of taxonomic analysis, with the help of which it is possible to classify and systematize complexly organized industries, spheres, subsystems of the national economy that have a hierarchical structure.

4. Results and discussion

In order to carry out a taxonomic analysis of the indicators of the institutional support of innovative enterprises in a certain region of the country that affect the management of their economic security, it is necessary to use the classical algorithm of actions:

- Formation of the table-matrix of the input primary data characterizing the institutional environment of entrepreneurship;
- Standardization of the input primary data of the observation matrix, which can be expressed both in absolute and relative dimensions (depending on the object of analysis and the goal that the researchers set for themselves, the available source base);
- Determination of the coordinates of the reference vector;
- Determination of the distance between the reference vector and the anti-reference;
- Calculation of the general taxonomic coefficient of institutional support.

The primary procedure with which the formation of the table-matrix of the input primary data begins is the selection and determination of multiple features of the institutional environment parameters that determine a certain level of economic security of the enterprise under study. Such sets, determined by measuring signs (indicators) of the activity of the institutional environment, are entered into the observation matrix, which has the form Eq. 3:

$$X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1r} & \dots & x_{1j} \\ x_{21} & x_{22} & \dots & x_{2r} & \dots & x_{2j} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ x_{n1} & x_{n2} & \dots & x_{nr} & \dots & x_{nj} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \dots & x_{mr} & \dots & x_{mj} \end{bmatrix} \quad (3)$$

where m is a set of objects of observation; j is a set of selected factors of the institutional environment; x_{nr} is the value of the factor r for object n .

The correct selection of matrix indicators affects the accuracy and reliability of the overall result of the proposed procedure for assessing economic security. Indicators can be expressed in both absolute and relative values. After the formation of the table-matrix of input primary data, which characterizes the institutional environment of entrepreneurship, their standardized values are calculated by Eq. 4 (standardization of the table-matrix of input primary data). Standardization of the table-matrix of input primary data allows reducing all data of a matrix in a uniform unit of measurement that eliminates the effect of heterogeneity of static data and deduces zero average and unit variance (Eqs. 4-6):

$$H_{nr} = \frac{x_{nr} - \bar{x}_r}{\delta_r}, \quad (4)$$

where:

$$\bar{x}_r = \frac{1}{m} \sum_{i=1}^m x_{ir}, \quad (5)$$

$$\delta_r = \left[\frac{1}{m} \sum_{i=1}^m (x_{ir} - \bar{x}_r)^2 \right]^{1/2}, \quad (6)$$

where δ_r is the standard deviation from the reference; x_{ir} is the value of the factor r for object i ; \bar{x}_r is the average value of the factor r ; H_{nr} is the standardization level of factor r for object n .

When conducting taxonomic evaluation, the indicators of institutional support should be divided into positive and negative. The standardized matrix includes stimulants that ensure the effectiveness of innovation and disincentives that inhibit entrepreneurial activity, forming institutional traps. For this purpose, the highest standardized indicators for the set of stimulants (Eq. 7) and the lowest for the indicators-disincentives (Eq. 8) should be determined:

$$H_{0q} = \max H_{iq}, \text{ if } q \in S, \quad (7)$$

$$H_{0q} = \min H_{iq}, \text{ if } q \notin S (q = 1, 2, \dots, j), \quad (8)$$

where S is a set of stimulants that have a positive effect on the development of innovative

development of entrepreneurship; q is the value of the input feature of institutional support; j is a set of selected factors of institutional support; H_{0q} is a reference feature q ; H_{iq} is the result of standardizing the value of the factor q for the object i .

These calculations allowed specifying the indicators of institutional support for stimulants and disincentives; this differentiation is an objective condition for the calculation of the reference indicator.

Further, there is a need to calculate the value between the individual observations and the reference vector using the Euclidean distance. Euclidean metric, or Euclidean distance, is calculated by the Pythagorean Theorem and allows determining the smallest distances between exponents in Euclidean space. Euclidean distance appears as a metric in space in Eq. 9:

$$Z_{n0} = \sqrt{\sum_{r=1}^m (z_{nr} - z_{0r})^2}, \tag{9}$$

where Z_{n0} is Euclidean distance between separately defined indicators in space and the reference vector; z_{nr} is the result of standardization of the r -th factor of the n -th object of observation; z_{0r} is the result of standardization of the r -th factor in the reference; m is a set of objects of observation.

The value of the total distance between the values of the factors and the reference is calculated as follows in Eq. 10:

$$Z_0 = \bar{Z}_0 + 2D_0, \tag{10}$$

where D_0 is a standard deviation.

The average distance (\bar{Z}_0) between the values of the factors and the reference vector is calculated by Eq. 11:

$$\bar{Z}_0 = \frac{1}{m} \sum_{n=1}^m Z_{n0}, \tag{11}$$

where m is a set of objects of observation; Z_{n0} is Euclidean distance between separately defined indicators in space and the reference vector.

The value of T_n can vary from 0 to 1 and shows the level of statistical characteristics of the set of objects. Given the existence of large differences in the input standardized values of the factors, we propose to increase the distance to 2.4 standard deviations, according to Eq. 12:

$$Z_0 = \bar{Z}_0 + 2,4D_0 \tag{12}$$

The standard deviation is calculated by Eq. 13:

$$D_0 = \sqrt{\frac{1}{m} \sum (Z_{n0} - \bar{Z}_0)^2}, \tag{13}$$

where (\bar{Z}_0) is the average distance between the values of the factors and the reference vector.

The result of the deviation of the vector of the n -th object from the reference is calculated as follows in Eq. 14:

$$dv_n = \frac{Z_{n0}}{Z_0} \tag{14}$$

After that, it is possible to calculate the taxonomic indicator of economic security of an innovative enterprise in Eq. 15:

$$T_n = 1 - dv_n \tag{15}$$

where dv_n is a deviation of the vector of the n -th object from the reference.

The next stage involves determining the systematization of the necessary indicators for assessing institutional support, which determine the level of economic security of enterprises and at the same time most fully specify the priorities of the innovative development of the region in terms of sectoral, territorial, structural, and temporal orientation. The distribution of these indicators by the corresponding groups of institutions for ensuring the development of entrepreneurship is shown in Table 1.

Taking into account the available information sources, as well as the obtained calculations, it is possible to propose such a system of indicators for the analysis of economic security of innovative entrepreneurship, which calculates a summary indicator of institutional support, which allows identifying the relationship between main integrated indicators and forecasting the future development of the region in which the investigated business entity carries out its activity. It is necessary to determine that the indicators of institutional support of entrepreneurship in the innovative economy are sufficiently branched, can be changed, supplemented, and the method of their calculation can be improved. Therefore, the list in Table 1 is conditional, far from complete, and cannot reflect all the features of the institutional environment of the region. However, given the limited statistical resource base, as well as the fact that the presented indicators are inherently a reflection of the socio-cultural and economic parameters of development, we will conventionally consider the list in question to be considered sufficient for the purpose of testing the main provisions of the methodology to assess the economic security of enterprises in order to ensure sustainable development of the regions of their functioning. This methodology was used to determine the prospects for the economic development of the regions of Ukraine based on the calculation of taxonomic coefficients of institutional support for innovative entrepreneurship in 2013-2020. The results of these calculations in the form of indicators of institutional support for innovative development of entrepreneurship in the regions of Ukraine are shown in Fig. 1.

The final values obtained as a result of the calculations may indicate "failures" of the institutional matrix. Thus, the presence of these "failures" can be noted in the institutional matrix in the Luhansk region (except for the Institute of Intellectual Property and the Institute of Infrastructure Support) and almost all institutions of Donetsk region (except the Institute of Financial and Credit Component, the Institute for the

Implementation of Innovations in Industry, the Intellectual Property).
 Institute of Export Activities and the Institute of

Table 1: Indicators for assessing the institutional support of business development

No.	Group of institutes	Indicators
1	The Institute of Human Capital	<p>X₁ is the proportion of institutions that train scientific personnel (graduate students) to the total number, %;</p> <p>X₂ is the proportion of institutions that train scientific personnel (doctoral students) to the total number, %;</p> <p>X₃ is the proportion of employed workers in the performance of research and development to the total number, %;</p> <p>X₄ is coefficient of intellectual labor productivity of scientific specialists, units;</p> <p>X₅ is the proportion of the volume of internal costs financing for the implementation of scientific research and development to the total volume, %;</p> <p>X₆ is the proportion of expenses for research and development carried out by co-contractors to the total volume, %;</p>
2	The Institute of Financial and Credit Component	<p>X₇ is the proportion of expenditures of industrial enterprises on innovation to the total, %;</p> <p>X₈ is the proportion of the number of financial and credit organizations that provided credit services to innovative enterprises on preferential terms, to the total number, %;</p> <p>X₉ is the proportion of the volume of services provided by banking institutions to entrepreneurs engaged in innovation activities, to the total volume, %;</p> <p>X₁₀ is the coefficient of availability of obtaining a loan for innovation, units;</p> <p>X₁₁ is transparency coefficient of the procedure for filing and registering a loan application for the implementation of innovative activities, units;</p> <p>X₁₂ is the proportion of industrial enterprises engaged in innovative activities of the total, %;</p> <p>X₁₃ is the proportion introduced new technological processes in the industry of the total, %;</p> <p>X₁₄ is the proportion of the introduced innovative types of products in the industry of the total, %;</p>
3	The Institute for the Implementation of Innovations in Industry	<p>X₁₅ is the proportion of the volume of sold innovative products by industrial enterprises, to the total volume, %;</p> <p>X₁₆ the proportion of new technologies acquired by industrial enterprises to the total amount, %;</p> <p>X₁₇ is the proportion of new technologies transferred by industrial enterprises to the total amount, %;</p> <p>X₁₈ is the proportion of enterprises that sold innovative products outside Ukraine to the total number, %;</p>
4	The Institute of Export Activities	<p>X₁₉ is the proportion of sold innovative products outside Ukraine, to the total volume, %;</p> <p>X₂₀ is the proportion of acquired new technologies outside Ukraine to the total amount, %;</p> <p>X₂₁ is the proportion of new technologies transferred outside Ukraine to the total amount, %;</p> <p>X₂₂ is the proportion of the submitted applications for inventions of the national applicants to the total number, %;</p>
5	The Institute of Intellectual Property	<p>X₂₃ is the proportion of patents received for inventions by national applicants to the total number, %;</p> <p>X₂₄ is the proportion of applications for utility models from national applicants to the total number, %;</p> <p>X₂₅ is the proportion of patents for utility models received by national applicants to the total number, %;</p> <p>X₂₆ is the coefficient of concentration of scientific institutions carrying out research and development, units;</p>
6	Institute of Infrastructure Support	<p>X₂₇ is the coefficient of concentration of other service institutions in the territory that provided services on innovation, units;</p>
7	The Institute of Regulatory and Legal Support	<p>X₂₈ is the coefficient of efficiency of normative legal acts regulating innovation activity, units;</p> <p>X₂₉ is the coefficient of law enforcement mechanisms, for innovation activities, units;</p> <p>X₃₀ is the coefficient of consistency of state and regional regulatory legal acts on innovation activities, units;</p> <p>X₃₁ is the coefficient of capacity of innovative intermediation, units;</p> <p>X₃₂ is the coefficient of satisfaction with the quality of services provided to entrepreneurs to innovators, units;</p>
8	The Institute of Public-Private Partnership and Mediation	<p>X₃₃ is the coefficient of unity, uniqueness and expediency of the services provided to entrepreneurs to innovators, units;</p> <p>X₃₄ is the coefficient of service provision at all stages of the life cycle of an innovative enterprise, units;</p> <p>X₃₅ is the share of outsourcing in the innovative activity of the enterprise, to the total volume, percent;</p> <p>X₃₆ is the coefficient of the experience of entrepreneurs in the exchange of personnel from research institutes, units;</p> <p>X₃₇ is the level of media adequacy in the region focused on the development of innovations, units;</p>
9	The Institute of Information Support	<p>X₃₈ is the level of awareness of innovative entrepreneurs about activities, programs, and projects implemented at the state and regional levels, units;</p> <p>X₃₉ is the level of awareness of innovative entrepreneurs about existing credit programs, investment measures to support innovative development, units;</p> <p>X₄₀ is the coefficient of the relationship frequency of innovative entrepreneurs with the media, units;</p> <p>X₄₁ is the coefficient of participation frequency of entrepreneurs in fairs, exhibitions at which innovative goods are presented, units.</p>

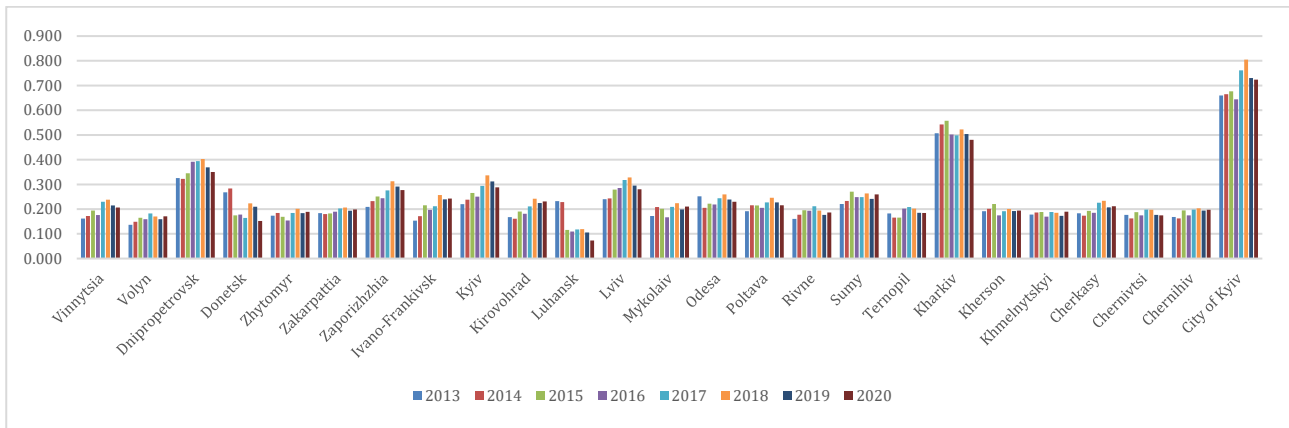


Fig. 1: The resulting indicators of institutional support for innovative development of entrepreneurship in Ukraine

Such indicators in these regions of Ukraine indicate a low level of economic security of innovative enterprises in them. At the same time, the leading position in terms of institutional support and, accordingly, the economic security of entrepreneurship is observed in the following regions of Ukraine: Kharkiv, Dnipropetrovsk, Zaporizhzhia, Kyiv and Lviv regions and the City of Kyiv.

Thus, the analysis of the main trends in the development of institutional support for innovative entrepreneurship in Ukraine, which provides an appropriate level of economic security for these entities and affects the stability of the country's regions showed the imperfection of the institutional environment due to existing institutional "failures" in Ukraine. This requires the government to implement a number of stabilization measures aimed at overcoming negative phenomena in the institutional environment, as well as the formation of an adaptive strategy in order to stimulate innovative development.

The advantage of this technique over the methods for assessing economic security proposed in other scientific works is that the summary assessment indicator is universal and its interpretation makes it possible to identify the relationship between the main integrated indicators for all regions of the studied country, taking into account the unevenness of their economic development, as well as to analyze the question of the causal nature of the transformation of the institutional environment and its consequent. In this regard, the use of the developed methodology will allow professionals in the most convenient way to identify the causal links that caused the recession in the regional economy and identify the most effective ways to overcome them.

5. Conclusion

As a result of the study, a directly proportional relationship was established between the efficiency of economic security management of innovative enterprises, which, in turn, is determined by the indicators of their institutional support, and the sustainable development of the regions in which

these business entities operate. The authors proposed a methodology for assessing the economic security of innovative entrepreneurship on the basis of a taxonomic analysis of the main indicators of its institutional support, which includes five stages: analysis of methodological approaches; research of the completeness of the information base; determination of methods for diagnosing transformations; substantiation of instrumental indifference; calculation of the summary indicator. The basis of this methodology is a system of indicators, in which the calculation of the summary indicator for assessing the institutional support of innovative enterprises is carried out, it makes it possible to identify the relationship between the integrated indicators and develop a forecast for the future development of the regions of their operation.

The practical significance of the taxonomic analysis the system of indicators of the institutional support of innovative entrepreneurship lies in certain urgent problems of its activities and the specification of the conditions for its state support within each institution (namely: The Institute of Human Capital, the Institute of Financial and Credit Component, the Institute for the Implementation of Innovations in Industry, the Institute of Export Activities, the Institute of Intellectual Property, the Institute of Infrastructure Support, the Institute of Regulatory and Legal Support, the Institute of Public-Private Partnership and Mediation, the Institute of Information Support). In addition, grouped and systematized indicators of institutional support that influence the modeling of economic security management of innovative entrepreneurship can be used in the process of forecasting the economic development of regions of the country and developing appropriate measures of state regulation of this process.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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