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GONCHARENKO, O. G. (https://orcid.org/0000-0003-1101-6019),
TOHOCHYNSKYI, O. M. (https://orcid.org/0000-0002-8170-6237),
ANISHCHENKO, V. O. (https://orcid.org/0000-0002-5062-3789),
and SIRENKO, K. Yu. (https://orcid.org/0000-0003-2705-0924)
Academy of State Penitentiary Service,
34, Honcha St., Chernihiv, 14000, Ukraine,
+380 462 67 6822, academy@kvs.gov.ua

ECONOMETRIC MODELLING OF INNOVATION-DRIVEN DEVELOPMENT OF UKRAINE'S INDUSTRIAL CAPACITY

Introduction. *Using the economic and mathematical evaluation methods is advisable to identify the areas of the development of innovation processes in the domestic industry and to outline their prospects for the future. In view of this, it is important to study the dynamics of innovation indicators and to build a model of innovation-driven development of Ukraine's industrial capacity.*

Problem Statement. *Economic processes and crises encourage the search for new forms and methods of management to ensure competitiveness and economic stability. Econometric modeling allows mathematically estimating the effect of innovations on the growth of industrial capacity, determining changes in innovation metrics, and, consequently, forecasting and planning the outcomes and degree of innovation processes.*

Purpose. *The purpose of this research is to model the level of innovation-driven development of Ukraine's industrial capacity by the method of multidimensional statistical analysis of innovation activity, for making optimal management decisions.*

Materials and Methods. *Methods of critical and economic analysis have been used to substantiate the econometric model, to compare and to group the innovation metrics.*

Results. *An algorithm for econometric modeling of innovation-driven development of industrial capacity, which contains four evaluation blocks has been developed. The dynamics of the domestic industry innovation metrics as main constituent element have been determined, estimated, and analyzed. The integrated indices of the innovation-driven development of industrial capacity, which reflect the cumulative changes that have occurred in their values over a certain period have been given. The values range from 0.50 to 0.71, which indicates a low innovation activity.*

Conclusions. *Modeling of integrated indices makes it possible to forecast changes in the innovation process in the future and alternative ways of its development.*

Keywords: modeling, industrial capacity, innovation-driven development, innovations, innovation activity.

Improving the competitiveness of the national economy based on R&D and innovative modernization of engineering, technological, and intellectual capacity of Ukraine is one of the most important strategic objectives. Developing innovative entrepreneurship, in-

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creasing creative human capacity through the reform of the education system, attracting global investment resources to finance research and educational programs are the fundamentals of innovation-driven development of any country. In this context, the search and use of adequate techniques for evaluating and modeling the innovation-driven development of industrial capacity with the use of the multidimensional statistical analysis, namely, the taxonomy method, remains an important research problem.

The value judgement of innovation-driven development of industrial capacity depends on the status of each element, their interaction with each other, and complementarity. In this sense, econometric modeling helps mathematically estimate the effect of innovation on the growth of industrial capacity, determine changes in the innovation metrics, and therefore forecast and plan the results and degree of innovation processes.

Many Ukrainian (O. Amosha, L. Baibakova, Y. Bazhal, E. Beltyukov, V. Bridun, V. Heyets, N. Goncharova, I. Gruznov, V. Gusev, S. Kireev, G. Kozachenko, N. Krasnokutska, M. Krayukhin, O. Kuzmina, V. Onishchenko, V. Semynozhenko, L. Fedulova, and S. Yagudina) and foreign (R. Akoff, P. Drucker, E. Mansfield, B. Santo, R. Foster, J. Schumpeter and others) researchers have studied the issues related to innovation-driven development and made a significant contribution to the study of innovation capacity.

However, despite the numerous studies, it should be noted that today, the method of modeling and forecasting the innovation-driven development of Ukraine’s industrial capacity needs to be improved. Also, it is necessary to develop the directions for accelerating innovation-driven growth in regions and throughout the whole country. Therefore, the subject of this research is relevant and needs to be further studied.

Proceeding from the above, the purpose of this research is to carry out econometric modeling of innovation-driven development of industrial capacity of Ukraine with the use of multidimensional statistical analysis of the innovation activity,

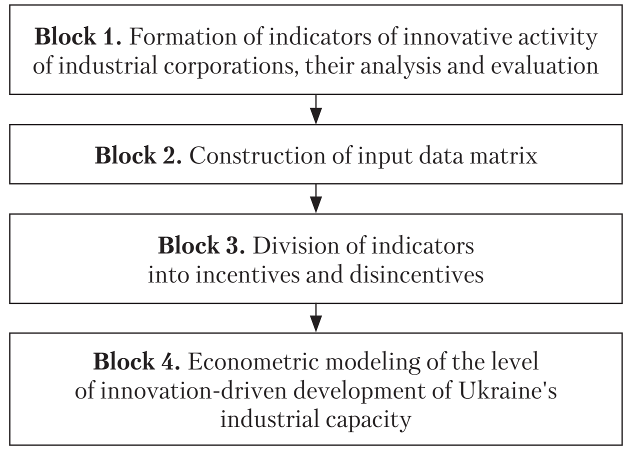

Fig. 1. Algorithm of econometric modeling of the innovation-driven development of Ukraine’s industrial capacity
Source: prepared by the authors.

to comprehensively summarize the results, and to make recommendations on adequate management decisions.

To judge the level of innovation-driven development of industrial capacity, we propose to use the method of multidimensional statistical analysis, namely, the taxonomy method, the main purpose of which is to make a generalized evaluation of the innovation process. The taxonomic index is calculated according to the classical algorithm of taxonomic analysis, which contains the following steps:

- to form a matrix of observations (MO);
- to standardize the values of the MO elements;
- to identify the reference vector;
- to determine the distance between the individual observations and the reference vector;
- to calculate the taxonomic coefficient of development [1].

This method is designed to identify the patterns in statistical aggregates, the units of which are characterized by a relatively large set of indicators. Therefore, its use enables various comparisons of multidimensional objects (Fig. 1).

The level of innovation-driven development is considered a point in multidimensional space:

$$X_t = (x_{t1}, x_{t2}, ..., x_{tm}),$$

where x_{tj} is j-th representative index that describes t-th parameter, $t = [1, T]$, $j = [1, m]$.

Let us consider and evaluate each blocks or stage.

Block 1. In order to implement economic and mathematical modeling of innovation-driven development of industrial capacity, it is necessary to take into account the indicators as the most significant constituent elements that determine this development. These include such indicators as: the sources of funding for innovation; the total amount of expenditure on innovation; the introduction of innovation at industrial corporations; the expenditure on research and development (R&D), and the labor resources involved in R&D.

Table 1 shows that in 2019, the innovation activities were funded mainly from corporation's own sources, government support was limited to the state budget and did not exceed 4% of the total funding. This shows a quite passive involvement of government into the innovation processes. At the same time, given a significant debt burden of domestic corporations, which in 2015—2019 increased by 65% [2], they are not able to materially raise expenditure on innovation from their own funds.

According to the State Statistics Service, for 17 years (2002—2019), the share of the total expenditure on innovation in GDP largely decreased from 1.3% to 0.47%. In 2019, the share of budget expenditure on innovation in the structure of Ukraine's GDP was small (4% or UAH 556.0 thousand), although grew as compared with previous years [3]. This is explained by the unstable political situation in the country and a high public debt of USD 90.26 billion [4], in 2019, which increased by 38% for 5 years. In addition, the problems related to increase in interest rates on loans, imbalances in long-term loans, increase in arrears, financial crises, inefficiency and non-transparency of the allocation of funds for projects have aggravated. Anyway, this amount of funding is not enough to ensure a proper development of the innovation component of the economy.

Table 1. **Sources of Funding of the Innovation Activity of Industrial Corporations, UAH million**

Year	Corporation's own funds	Budget funds	Nonresident investor funds	Funds from other sources
2015	13427.0	55.1	58.6	273.0
2016	22036	179.0	23.4	991.1
2017	7704.1	227.3	107.8	1078.3
2018	10742.0	639.1	107.0	692.0
2019	12147.9	556.0	42.5	1147.0
Growth, %	90.4	1009.0	72.5	420.1
Absolute difference (+/–)	–1279.1	500.9	–16.1	874

Note: prepared and estimated by the authors based on the Science and Innovation of Ukraine statistical collection.

As compared with the EU member states, the share of R&D expenditure in GDP averaged 2.12% [3]. The largest share of R&D expenditure belongs to Germany (3.13%). Ukraine has the lowest one (0.47%) falling behind Romania (0.50%), Latvia (0.64%), Bulgaria (0.76%), and Lithuania (0.94%).

In the reporting period, the distribution of expenditure by areas of innovation shows an unstable, wavy nature. Over the years, the funding for in-house R&D, the acquisition of external knowledge, machinery, equipment and software has been decreasing.

In 2015—2019, the number of innovative industrial corporations fell significantly from 824 or 17.3% of the total number of corporations, in

Table 2. **Total Expenditure on Innovation Activities of Industrial Corporations, UAH million**

Year	In-house R&D	Acquisition of other external knowledge	Purchase of machinery, equipment, and software	Other expenditure
2015	2039.5	84.9	11141.3	548.0
2016	2457.8	64.2	19829.0	878.4
2017	2169.8	21.8	5898.8	1027.1
2018	3208.8	46.1	8291.3	633.9
2019	2918.9	37.5	10185.1	1079.4
Growth, %	143.1	44.1	91.4	196.9
Absolute difference (+/–)	879.4	–47.4	–956.2	531.4

Note: prepared and estimated by the authors based on the Science and Innovation of Ukraine statistical collection.

2015, to 782 or 15.8%, in 2019 [3]. Similarly, the industrial corporations that introduced innovations and the commercialized innovations have been dropping. In the reporting period, the sales of industrial innovations fluctuated between 1.4%, in 2015, and 0.7%, in 2017, including 1.3%, in 2019.

These figures show that, despite the proclamation of innovation-driven development as one of the priorities in Ukraine, it is useless to expect an innovation breakthrough in the near future unless radical transformations are implemented.

A significant reduction in the labor inputs R&D by 44% also remains an acute problem. It is caused by a low prestige of research work, low salary and poor social protection of researchers, a gradual degradation of physical facilities and lack of funds for upgrades of machinery and equipment. All these factors lead to the outflow of young talented people to other economic sectors or abroad.

In Ukraine, 57.3% of the R&D expenditure goes to improving materials, products, processes, devices, technologies, systems, and services. The expenditure on fundamental and applied research, the development of new products, new materials, technologies, treatment methods, medical products and equipment accounts for 43%. Such a situation leads to dependence on import of both new technologies and finished high-tech products and to a decline in export of domestic innovation products.

Table 3. **Commercialization of Innovations at Industrial Corporations**

Year	Industrial corporations that introduce innovations (products and or processes	Sales of industrial innovations (goods, services), UAH billion	New processes introduced	Commercialized innovations (goods, services)
2015	723	23.0	1217	3136
2016	735	*	3489	4139
2017	672	17.7	1831	2387
2018	739	24.8	2002	3843
2019	687	34.2	2318	2148
Growth, %	95.0	148.7	190.4	68.5
Absolute difference (+/–)	–36	11.2	1101	–988

Note: *the index has not been estimated. Prepared and estimated by the authors based on the Science and Innovation of Ukraine statistical collection.

In the second block, the input data matrix is formed

$$X' = \{x'_{tj}\}_{T \times p},$$

where x'_{tj} is the value of the j-th representative indicator, $j = [1, p]$, $t = [1, T]$, T is reporting period, p is elements that reflect the significance of the j-th indicator.

Table 4. **Labor Resources Involved in R&D, persons**

Year	Researchers	Employees without higher education	Technicians	Backstopping staff
2015	90249	12756	11178	21077
2016	63694	12699	10000	24218
2017	59392	12491	9144	25738
2018	57630	11673	8553	21945
2019	51121	10518	7470	20671
Growth, %	56.6	82.4	66.8	98.0
Absolute difference (+/–)	–39128	–2238	–3708	–406

Note: prepared and estimated by the authors based on the Science and Innovation of Ukraine statistical collection.

Table 5. **R&D Expenditure by Activities**

Year	Fundamental research, UAH thousand	Applied research, UAH thousand	R&D, UAH thousand	Gross expenditure on R&D by type of expenditure, UAH million
2015	2460.2	1960.6	6582.8	13161.3
2016	2225.7	2561.2	6743.8	12661.0
2017	2924.5	3163.2	72916	15285.7
2018	3756.5	3568.3	9448.9	18634.2
2019	3740.4	3635.7	9878.5	19901.4
Growth, %	152.0	185.4	150.0	151.2
Absolute difference (+/–)	1280.2	1675.1	3295.7	6740.1

Note: prepared and estimated by the authors based on the Science and Innovation of Ukraine statistical collection.

Since the initial indicators are presented in different units, the standardization procedure is required.

Setting the input data in the form of matrix allows us to study changes or value of parameters in different objects that describe the status of one object over time.

The input data matrices for:

1) the score of sources of funding of innovation activity of industrial corporations:

$$X = \begin{vmatrix} 0.972 & 0.949 & 0.845 & 0.882 & 0.854 \\ 0.004 & 0.008 & 0.025 & 0.052 & 0.039 \\ 0.004 & 0.001 & 0.012 & 0.009 & 0.003 \\ 0.020 & 0.043 & 0.118 & 0.057 & 0.081 \end{vmatrix}$$

2) the score of expenditure by innovation activity:

$$X = \begin{vmatrix} 0.148 & 0.106 & 0.238 & 0.263 & 0.205 \\ 0.006 & 0.003 & 0.002 & 0.004 & 0.003 \\ 0.807 & 0.854 & 0.647 & 0.681 & 0.716 \\ 0.040 & 0.038 & 0.113 & 0.052 & 0.076 \end{vmatrix}$$

3) the score of innovation commercialization:

$$X = \begin{vmatrix} 0.142 & 0.088 & 0.137 & 0.112 & 0.132 \\ 0.005 & 0.000 & 0.004 & 0.004 & 0.007 \\ 0.239 & 0.417 & 0.373 & 0.303 & 0.447 \\ 0.615 & 0.495 & 0.486 & 0.581 & 0.414 \end{vmatrix}$$

4) the score of labor inputs in R&D:

$$X = \begin{vmatrix} 0.667 & 0.576 & 0.556 & 0.577 & 0.569 \\ 0.094 & 0.115 & 0.117 & 0.117 & 0.117 \\ 0.083 & 0.090 & 0.086 & 0.086 & 0.083 \\ 0.156 & 0.219 & 0.241 & 0.220 & 0.230 \end{vmatrix}$$

5) the score of expenditure on R&D by activity:

$$X = \begin{vmatrix} 0.102 & 0.092 & 0.031 & 0.106 & 0.101 \\ 0.081 & 0.106 & 0.034 & 0.101 & 0.098 \\ 0.272 & 0.279 & 0.773 & 0.267 & 0.266 \\ 0.545 & 0.523 & 0.162 & 0.526 & 0.536 \end{vmatrix}$$

Since different parameters may be measured in different units, we have standardized the parameters (metrics). To this end, the following factors are determined:

— arithmetic mean $X_i = \frac{1}{m}\sum_{i=1}^{m} X_{ij}$;

— standard deviation of the j-th parameter $\sigma_i = \left[\frac{1}{m}\sum_{i=1}^{m}(X_i - X_j)^2\right]^{\frac{1}{2}}$;

— standardized value of the j-th object $Z_{ij} = \frac{X_i - X_j}{\sigma_i}$.

The standardized matrix is formed:

$$X = \begin{pmatrix} z_{11} & \dots & z_{1j} & \dots & z_{1n} \\ \dots & \dots & \dots & \dots & \dots \\ z_{i1} & \dots & z_{ij} & \dots & z_{in} \\ \dots & \dots & \dots & \dots & \dots \\ z_{m1} & & z_{im} & & z_{mm} \end{pmatrix}$$

1) for the score of innovation funding source:

$$Z = \begin{vmatrix} 2.16 & 1.77 & 0.65 & -0.62 & -0.55 \\ 0.07 & 0.91 & 0.28 & 0.11 & -0.27 \\ -0.82 & -0.39 & 0.41 & 0.84 & 1.01 \\ -0.82 & -0.89 & -2.25 & 1.42 & 1.53 \end{vmatrix}$$

2) for the score of expenditure by innovation activity:

$$Z = \begin{vmatrix} -0.48 & -0.64 & 0.85 & 2.31 & 2.14 \\ -0.67 & -0.71 & 0.40 & -0.28 & -0.28 \\ -0.20 & -0.75 & -0.68 & -0.32 & -0.18 \\ -1.03 & -0.64 & -0.77 & -0.41 & -0.74 \end{vmatrix}$$

3) for the score of innovation commercialization:

$$Z = \begin{vmatrix} -0.58 & -0.94 & -0.77 & 1.02 & -0.84 \\ -0.21 & 0.16 & 1.58 & 0.59 & 1.32 \\ -0.25 & 0.91 & -1.36 & 1.24 & 0.53 \\ 2.15 & - & 0.11 & -1.13 & -1.41 \end{vmatrix}$$

4) for the score of labor inputs in R&D:

$$Z = \begin{vmatrix} -0.65 & 0.79 & -0.18 & 0.16 & -1.18 \\ -0.67 & 0.30 & -0.18 & -1.35 & 0.07 \\ 0.28 & -0.33 & 0.99 & 0.16 & 0.30 \\ -0.07 & 1.00 & -0.18 & -0.70 & 1.21 \end{vmatrix}$$

5) for the score of expenditure on R&D by activity:

$$Z = \begin{vmatrix} 0.86 & 1.09 & -0.45 & 0.17 & 0.44 \\ 0.13 & 1.70 & -0.29 & 0.17 & -0.05 \\ 0.60 & -0.86 & -1.52 & 0.41 & 0.64 \\ 0.03 & 1.10 & 0.09 & 0.80 & 1.12 \end{vmatrix}$$

In **the third block**, the indicators are divided into the incentives and the disincentives. These types of indicators are introduced in order to take into account their economic content: the incentives increase the level of innovation development, while the disincentives reduce it. In general, the type of index is defined as:

The incentives: $(x_{sj} \geq x_{rj}) \Rightarrow w_s \succ w_r$.

The disincentives: $(x_{sj} \geq x_{rj}) \Rightarrow w_s \prec w_r$.

The incentive condition means that object w_s dominates over object w_r, which formally is written as: $w_s \succ w_r$, if $x_{sj} \geq x_{rj}$. The disincentive condition describes the opposite situation. In this case, object w_r dominates over object w_s, if $x_{sn} \geq x_{rn}$. The upper pole coordinates is calculated as:

$$P_0 = [p_{01}, p_{02}, ..., p_{om}],\ p_{0j} = \max_t X_{tj}.$$

The distances between the innovation development status points and the upper pole P_0 are calculated as:

$$d_t = [\sum_{j=1}^{m}(x_{tj} - p_{0j})^2]^{\frac{1}{2}},\ t = [1,T].$$

The innovation-driven development index is calculated as $M_t = d_t/c_0$, $t = [1, \text{T}]$

$$c_0 = \bar{d} + a{*}S_d\,,\ \bar{d} = \frac{1}{T}\sum_{i=1}^{m} d_t,\ S_d = [\frac{1}{T}\sum_{i=1}^{m}(d_t - \bar{d})^2]^{\frac{1}{2}},$$

where a is some positive number selected in such a way as the values of M_t vary within the range from 0 to 1.

Calculation of the reference point; the reference point (vector) is formed according to the rule: among the incentives those with maximum values and among the disincentives those with the minimum values are selected (Table 6).

The fourth block provides economic interpretation of the results and econometric modeling of innovation-driven development of Ukraine's industrial capacity.

The importance of each partial index is proposed to be determined separately by the Saati hierarchy analysis. The method provides for the decomposition of indicators into increasingly simple components and their further processing by pairwise comparisons. As a result, the relative degree (intensity) of interaction of elements in the hierarchy is determined.

To obtain the value function of the components for estimating the level of innovation-driven development of industrial capacity, it is necessary to construct a matrix of pairwise comparisons of all components and to determine the weights with the use of the Saati method. Constructing the value function by the Saati hierarchy analysis may be divided into several successive stages:

The first stage is to determine the factors, criteria, and scales based on which the system is

Table 6. **Division of Indicators into the Incentives and the Disincentives**

Parameter	Incentive or disincentive
1	2
Innovation funding sources	
Corporation's own funds	incentive
Funds from national budget	incentive
Nonresident investor funds	incentive
Funds from other sources	incentive
Expenditure by innovation activity	
R&D	incentive
Acquisition of other external knowledge	incentive
Purchase of machinery, equipment, and software	incentive
Other expenditure	incentive
Commercialization of innovations	
Number of industrial corporations that introduce innovations (products and/or processes)	incentive
Sales of innovation products (goods, services)	incentive
Number of new processes introduced into production	incentive
Number of types of innovation products (goods, services) commercialized in the reporting year	incentive
Labor inputs in R&D	
Researchers	incentive
Employees without higher education	disincentive
Technicians	incentive
Backstopping staff	incentive
Expenditure on R&D by activity	
Fundamental research	incentive
Applied research	incentive
R&D	incentive
Gross expenditure on R&D by type of expenditure	incentive

Source: prepared by the authors.

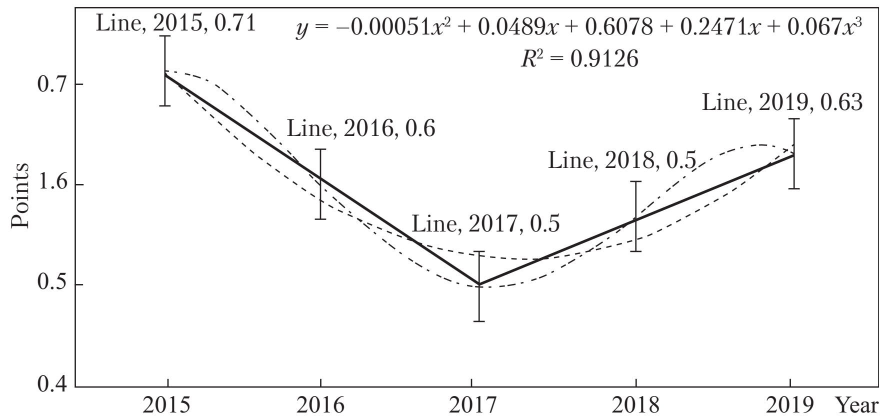

Fig. 2. Econometric modelling of innovation-driven development of Ukraine's industrial capacity

evaluated. Further, a hierarchy of indicators is built on the basis of selected factors and criteria for evaluating the system.

The second stage of the method is scoring based on a scale from 1 to 9, where 1 is the equal importance of both criteria, 5 is a strong advantage of the first criterion over the second, and 9 is the absolute advantage. If, on the contrary, the second criterion is more important than the first one, the inverse score (1/3, 1/5 or 1/9) is used. The intermediate values are for a more accurate evaluation.

At **the third stage**, for each matrix, the vector of priorities of one criterion over another is calculated: the elements of each row are summed; the distribution of each sum is normalized by the sum of all elements; the sum of the obtained results shall be equal to one.

For this, the maximum characteristic value λ_{max} and, based on it, the consistency index are calculated:

$$\text{ICi} = \frac{(\lambda_{max} - n)}{n - 1}.$$

If the consistency index is high enough, there is a need to reconsider judgments, because the reason for disagreement is often an incorrect evaluation of one parameter with respect to all others. Let us make a matrix of coefficients for pairwise comparisons (Table 7).

By normalizing the matrix of pairwise comparisons, the weight coefficients are obtained to determine the index of innovation-driven development of Ukraine's industrial capacity by determining the share of each index from the total weight coefficients (Table 8).

The results are shown in Fig. 2.

Based on the calculations, we have built and modeled the integral indicators of the innovation-

Table 7. **Matrix of the Coefficients for Pairwise Comparisons**

Indicator	Innovation funding sources	Expenditure by innovation activity	Commercialization of innovations	Expenditure on R&D by activity
Innovation funding sources	1.00	1/2	1/6	1/4
Expenditure by innovation activity	2.00	1.00	1.00	1.00
Commercialization of innovations	6.00	4.00	1.00	0.42
Expenditure on R&D by activity	2.00	1.02	2.04	1.00

Source: calculated by the authors.

Table 8. **Weight Coefficients**

Indicator	Innovation funding sources	Expenditure by innovation activity	Commercialization of innovations	Expenditure on R&D by activity
Weight	0.48	0.32	0.41	0.35

Source: calculated by the authors.

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driven development of industrial capacity, which reflect the cumulative changes in their values over years.

Experimental modeling of the level of innovation-driven development of industrial corporations ranges from 0.50 to 0.71. Its lowest value (0.50) is observed in 2017 and the highest one (0.71) is reported in 2015. The status of innovation in Ukraine cannot be considered satisfactory, because of the following factors: limited financial capacity; a low share of the knowledge-intensive product in GDP; a low number of researchers involved in research; reducing number of innovating corporations and decreasing share of commercialized innovation products; growing debt burden on industrial corporations and a limited strict access to loans for corporations involved in R&D (a high NBU discount rate); underdeveloped system of the R&D and innovation at the regional level.

However, the government approved the State Strategy for Regional Development for 2021—2027 [5], in 2020, and the Strategy for Innovation-Driven Development of Ukraine up to 2030 [6], in 2019, to increase the number of economic entities involved in inventions, first of all, outside the public sector, to accelerate economic growth of regions, and to enhance their competitiveness. However, no significant breakthrough in innovation processes is expected, despite the fact that in Ukraine, there are many concepts and programs for science and innovation, with innovation and R&D periodically discussed at the parliamentary level. The recommendations made in previous years are either ineffective or mostly not implemented, and the financial, credit, tax, customs and other levers to ensure the innovation-driven development do not work properly [7].

Based on the above, it can be stated that the proposed method of taxonomy for econometric modeling of innovation-driven development of Ukraine's industrial capacity provides unambiguous and objective evaluation results. The indicators of innovation-driven development reflect the cumulative changes over a certain period, which confirms the representativeness of the obtained quantitative evaluation.

In our opinion, for the growth of the industrial capacity and the intensification of innovation, economic regulation measures are needed to be implemented at the government level. In particular, it is necessary to reduce the tax burden and the burden of old debts on relatively active innovating corporations; to restore the income tax relief to the corporations that invest it in the development and renewal of their own production facilities; to allocate budget funds for partly reimbursing interest payments on loans spent on upgrading production facilities and implementing export contracts; for partly reimbursing interest payments on lease of equipment; for implementing national targeted investment program; to restore the binding distribution of graduates of state-owned higher educational establishments, whose student fee is paid from budget funds; to create and to develop research and production complexes and hi-tech centers for ensuring the implementation of advanced engineering and technological solutions in industry; to increase the funding of fundamental and applied research from the state budget; to create a system of product quality and safety risk insurance; and to organize state insurance of export of the products.

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О.Г. Гончаренко (https://orcid.org/0000-0003-1101-6019),
О.М. Тогочинський (https://orcid.org/0000-0002-8170-6237),
В.О. Аніщенко (https://orcid.org/0000-0002-5062-3789),
К.Ю. Сіренко (https://orcid.org/0000-0003-2705-0924),
Академія Державної пенітенціарної служби,
вул. Гонча, 34, Чернігів, 14000, Україна,
+380 462 67 6822, academy@kvs.gov.ua

ЕКОНОМЕТРИЧНЕ МОДЕЛЮВАННЯ ІННОВАЦІЙНОГО РОЗВИТКУ ПРОМИСЛОВОГО ПОТЕНЦІАЛУ УКРАЇНИ

Вступ. Для виявлення напрямків розвитку інноваційних процесів у вітчизняній промисловості та окреслення їх подальших перспектив доцільно застосовувати економіко-математичні методи оцінки. Тому важливим є дослідження динаміки показників інноваційної діяльності та побудова моделі інноваційного розвитку промислового потенціалу України.

Проблематика. Економічні процеси та кризові явища спонукають до пошуку нових форм і методів господарювання для забезпечення конкурентоспроможності й економічної стійкості. Застосування економетричного моделювання дозволяє математично розрахувати вплив інновацій на зростання промислового потенціалу, визначити зміну значень показників інноваційної діяльності, а отже, прогнозувати й планувати результати і ступінь інноваційних процесів.

Мета. Змоделювати рівень інноваційного розвитку промислового потенціалу України методом багатовимірного статистичного аналізу інноваційної діяльності для прийняття оптимальних управлінських рішень.

Матеріали й методи. Методи критичного й економічного аналізу застосовано для обґрунтування економетричної моделі та порівняння, групування показників інноваційної діяльності.

Результати. Розроблено алгоритм економетричного моделювання інноваційного розвитку промислового потенціалу, що містить чотири блоки оцінки. Визначено, розраховано та проаналізовано динаміку основних складових елементів-показників, що розкривають інноваційну діяльність вітчизняної промисловості. Сформовано матрицю вихідних даних та здійснено стандартизацію значень елементів матриці спостережень. Змодельовано економетричну модель інноваційного розвитку промислового потенціалу України. Наведено інтегральні показники рівня інноваційного розвитку промислового потенціалу, що відображають сукупні зміни, які сталися в їхніх значеннях за певний період. Ці значення коливаються у межах 0,50—0,71, що вказує на низький рівень інноваційної активності.

Висновки. Моделювання інтегральних показників дає можливість прогнозувати зміни інноваційного процесу у майбутньому та альтернативні шляхи його розвитку.

Ключові слова: моделювання, промисловий потенціал, інноваційний розвиток, інновації, інноваційна діяльність.