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THE ROLE OF INNOVATIVE DETERMINANTS IN ENSURING THE ECONOMIC SECURITY OF THE STATE

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Abstract: *This article summarizes the arguments and counterarguments within the scientific debate on determining innovative determinants for ensuring a country's economic security. The article summarizes the scientific approaches to determining the country's economic security's essence and components. Based on the generalization of existing developments, a set of the most relevant indicators for the quantitative assessment of the state's economic security was formed. It took into account budgetary, debt, investment, and other dimensions. All partial indicators of the formation of the integral indicator of the state's economic security were normalized using the minimax method. Integration of partial indicators was carried out based on additive convolution. A set of indicators characterizing the state's innovative potential was formed to determine innovative drivers and inhibitors of ensuring the state's economic security. Determining the influence of innovative parameters on the state's economic security was carried out using the PMG toolkit in the Stata 12/SE software product. It allowed formalizing innovative determinants affecting the state's economic security in short- (up to 1 year) and long-term (over 1 year) perspectives. For those variables for which the existence of a long-term relationship was established, an in-depth study was conducted using distributional-lag modelling. It allowed identifying specific time lags in the lateness of the response of the integral indicator of the state's economic security to the impact of innovative determinants. The research was conducted in 11 countries, including Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Poland, Romania, and Ukraine. The time horizon of the study covers the period 2005-2020 (or the latest available period). The research results could be useful to scientists, state authorities, and local governments.*
Keywords: country economic security, innovative determinants, sustainable public administration, panel data, distributive-lag modelling.
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Introduction. In the global turbulence conditions, it becomes crucial to identify parameters that form the internal mechanisms for ensuring the country's economic security and formalize external factors that influence it. At the same time, despite the existence of a significant volume of theoretical and practical approaches to the identification of the components of national security as a whole and a country's economic security as its fundamental element, there is still the necessity for permanent updating these studies with taking into account new challenges of a local, national and global nature. Moreover, it is also important to consider specific national evolutionary patterns of socio-economic development and its prospective short and long-term priorities. Nevertheless, in Industry 4.0, innovations and new technologies are gaining importance in all spheres of socio-economic life. Considering the above, research aimed at forming an integral indicator of a quantitative assessment of the country's economic security level and determining innovative drivers and inhibitors of its provision in the short- and long-term perspective is important and relevant.

Literature Review. It should be noted that within this block of the research, existing scientific results might be combined in several meaningful blocks: 1) clarifying the components and indicators of a quantitative assessment of the state's economic security; 2) identifying a list and the scale of influence of various innovative determinants on individual parameters of the state's economic security and its integral level.

Therefore, Kubaienko (2018) defined economic security as a complex and multifaceted concept, covering such projections as energy, transport, financial, industrial, agricultural, information, tourism, scientific and technological security, etc. Bossert and D'Ambrosio (2013) defined the country's economic security as the total sum of economic security of economic agents in this system. Mostenska et al. (2022) also followed a similar approach and, in particular, noted that economic security «could be considered as an economic aspect of the life of an individual or household that provides the opportunity to achieve financial stability and improve living standards». Researchers also emphasized that food security is one of the crucial components of Ukraine's economic security at the current stage of development.

Prieto (2022) emphasized that unexpected shocks, unemployment, and poverty are the main manifestations of the country's economic security level violation. Therefore, among the important determinants of the country's economic security, such as high employment level and fair income distribution (based on the Gini coefficient), should be noted.

In turn, Hacker et al. (2014) noted that an important role in ensuring the country's economic security is played by the social component. It involves the effective operation of the social protection and social security system, the health care system, and the sufficiency of household incomes to obtain quality medical care. All these parameters affect the life expectancy and mortality rate of the population.

Streimikiene et al. (2022), studying the impact of environmental taxes on environmental, economic, and energy security, pointed out the following determinants of the quantitative characteristics of economic security: GDP growth, GDP per capita, gross fixed capital formation, unemployment rate, current account balance, income distribution, industry value added. Bilan et al. (2020) found that eco-innovations positively affect the entrepreneurial development and investment attractiveness of such innovatively active enterprises. Eco-innovation also might stimulate the country's economic security provision through appropriate channels. In turn, Grencikova et al. (2019) noted that «elimination of corruption, development of logistic infrastructure and increase of population with advanced education» are also important determinants of the sustainable development of the business sector and ensuring the economic security of the country, especially in the Central and Eastern European countries. Bilan et al. (2019) investigated the influence of Industry 4.0 on the economic stability and security of the country. In this study, the researchers found that the countries with a balanced and well-developed sphere of information and communication technologies have stable and trending economic growth rates. At the same time, shocks and fluctuations are observed in countries where the field of ICT is in its germinal stage, which leads to a violation of the sustainability of economic development and national security. Surovicova et al. (2022) studied how innovative information technologies could guarantee economic growth and combat corruption. Based on the modeling results, the scientists found that the increase in the level of digitalization and the decrease in the level of corruption in the country lead to activating transmission effects, which strengthen the pace of economic growth in the country. Kuzmenko and Bozhenko (2021) concluded that the development of the shadow sector of the economy and the expansion of corruption schemes create serious threats to the violation of the state's economic security. Scientists also emphasize that these threats do not exist separately but could cause negative synergy.

Kuzmenko et al. (2021) focused their research on identifying threats of an innovative and technological nature, which determine the growth of risks of destabilization of the financial sector. Thus, scientists found that innovative inhibitors of the security of the country's financial sector are «growth of using online banking, improvement of internet user skills, expansion of activities online». Similar results were obtained by Leonov

et al. (2021). In particular, the researchers found that the development of FinTech innovations contributes not only to reducing the risks of disrupting the stability of the financial market but also acts as a guarantee of ensuring the state's economic security. Kuzmenko and Koibichuk (2018) analyzed the transmission channels of shocks from the banking sector to the entire economic system. Researchers, in particular, established that several social parameters (in particular, gender imbalances) could provoke the transmission of shocks to other adjacent sectors of the economy and cause fluctuations in the level of economic security. Mahyideena et al. (2012) investigated the impact of information and communication technologies and infrastructure on economic growth in ASEAN-5 countries (Indonesia, Malaysia, Thailand, Singapore, and the Philippines) for the period 1976-2010 using Pooled Mean Group Estimation. Researchers, in particular, defined the innovative determinants as the «number of fixed and mobile phone subscriptions, telephone lines, mobile cellular subscribers and internet users». Based on the modeling results, the researchers confirmed that all the selected innovative determinants act as drivers of economic growth in the long-term perspective in the selected countries.

Thus, the researchers defined the country's economic security as a complex and multifaceted concept. Still, the innovativeness of this study lies precisely in the identification of the influence of innovative and technological determinants on the Economic Security Index of the state in the short and long-run, which aims to formalize operational and strategic innovative drivers and inhibitors of economic security, ensuring in 11 countries, including Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Poland, Romania, and Ukraine.

Methodology and research methods. The main task of this research is the formation of an integral indicator of the quantitative assessment of the country's economic security level and the determination of innovative drivers and inhibitors of its ensuring in the short and long term. Thus, this study could be divided into two blocks: 1) formation of an integral indicator of the economic security of the state; 2) determination of the parameters of economic development, which cause a positive or negative effect on the country's economic security in the short- or long-term perspective.

The study was conducted in 11 countries, including Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Poland, Romania, and Ukraine. The time horizon of the study covers the period 2005-2020 (or the latest available period). Based on the literature review results, it was established that scientists most often distinguish such components as resource, financial, macroeconomic, socio-demographic, food, investment-innovation, budget, and foreign-economic security as part of the economic security of the state. For each of these components from the World Development Indicators collection of the World Bank Group (World Bank Data Bank, 2022), appropriate quantitative assessment indicators were selected, including:

- Agricultural land (% of land area) (AgL);
- Agriculture, forestry, and fishing, value added (% of GDP) (AgVA);
- CO2 emissions (metric tons per capita) (CO2);
- Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (WatStr);
- Commercial bank branches (per 100,000 adults) (Branch);
- Domestic credit to the private sector (% of GDP) (CrD);
- Current account balance (% of GDP) (CAB);
- GDP growth (annual %) (GDPg);
- Inflation, consumer prices (annual %) (Infl);
- Employment to population ratio, 15+, total (%) (modeled ILO estimate) (Empl);
- Gini index (Gini);
- Death rate, crude (per 1,000 people) (DR);
- Life expectancy at birth, total (years) (Lexp);
- Food exports (% of merchandise exports) (FoodEX);
- Food imports (% of merchandise imports) (FoodIM)Ж
- Food production index (2014-2016 = 100) (FoodPro);
- Foreign direct investment, net (BoP, current US$) (FDIn);
- Portfolio investment, net (BoP, current US$) (Portfolio);
- Gross fixed capital formation (% of GDP) (GFCF);
- Research and development expenditure (% of GDP) (RD);
- General government final consumption expenditure (% of GDP) (GGFCE);

- Military expenditure (% of GDP) (MilExp);
- Tax revenue (% of GDP) (Tax);
- Total reserves in months of imports (Res);
- Trade (% of GDP) (Trade).

It should be noted that some of these indicators had omitted observations, and therefore, the extrapolation method carried out their forecasting. Considering that most indicators of a quantitative assessment of the country's economic security have different units of measurement, it is advisable to bring them to a comparable form through the normalization procedure. This process involves the following algorithm of actions:

1) for indicators whose growth positively affects the level of economic security of the state, normalization is proposed to be carried out by dividing the actual value of the indicator for a specific country in a specific year by the maximum value of this indicator within all observations;

2) for indicators whose growth negatively affects the economic security of the country, normalization is proposed to be carried out by dividing the minimum value of the indicator for all observations by the actual value of this indicator for a specific country in a specific year;

3) for indicators that have both positive and negative values, first, the absolute (modulo) value of the largest negative value for all observations is added to all values of the indicator, and only then one of the normalization methods described in paragraph 1 or 2 is chosen.

After bringing it to a comparable form, the next stage is to determine the weighting coefficients of each of the 25 indicators of a quantitative assessment of the country's economic security. For this purpose, it is proposed to use principal component analysis. This method allows for determining the significance of the corresponding indicator. In particular, to increase the reliability of the results, it is proposed to use eigenvalues not only within the vector of the first principal component but to determine the average of the eigenvalues of a specific indicator of the quantitative assessment of the level of national security of the country by all principal components, which explain at least 70% of the total variation. In the next step, each of the indicators is assigned a rank according to the level of determining average eigenvalues (a higher rank indicates the higher importance of an individual indicator in ensuring the country's economic security). At the final step of this stage, weighting coefficients are determined by dividing the rank of the corresponding indicator by the total sum of ranks (the sum of ranks for all 25 indicators is 325).

The country's Economic Security Index (ESI) formation occurs by multiplying the corresponding weighting coefficients by the current normalized value of the individual quantitative indicator for a specific country in a particular year, with their subsequent convolution. The next stage of this research is the determination of innovative drivers and inhibitors to ensure the state's economic security. For this, a set of such potential innovative determinants from the World Development Indicators collection of the World Bank Group was formed (World Bank Data Bank, 2022):

- Charges for the use of intellectual property, payments (BoP, current US$) (Intel1);
- Charges for the use of intellectual property, receipts (BoP, current US$) (Intel2);
- Communications, computer, etc. (% of service exports, BoP) (ComEx);
- Communications, computer, etc. (% of service imports, BoP) (ComIm);
- Fixed broadband subscriptions (per 100 people) (Subscr);
- High-technology exports (% of manufactured exports) (HTE);
- ICT goods exports (% of total goods exports) (ICTGex);
- ICT goods imports (% total goods imports) (ICTGim);
- ICT service exports (% of service exports, BoP) (ICTSex);
- ICT service exports (BoP, current US$) (ICTSim);
- Individuals using the Internet (% of the population) (Internet);
- Patent applications, nonresidents (Patent1);
- Patent applications, residents (Patent2).

The next step within this stage is to determine the expediency of including innovative determinants in the model. For this purpose, pairwise correlation coefficients were calculated. Only those innovative determinants characterized by at least a moderate correlation with the Country Economic Security Index were included in the next stage of modeling.

In the next stage, to identify short- and long-term relationships between factors, models were built using the Pooled Mean Group Estimation (Pesaran et al., 1999) – a special add-on for the Stata 12/SE software product.

At the final stage of the research, for those innovative determinants for which the existence of a relationship

with the dependent variable was established in the long term, a lag model was built (lags from 1 to 5 years were tested), and it was determined with which lag the influence of the innovative independent determinant on the country's economic security is stronger.

Results. After conducting the preparatory stage of the study, which involves the formation of an input array of statistical information (both indicators of the quantitative assessment of the level of economic security of the country and determinants of innovative development), as well as bringing the first group of parameters to a comparable form according to the algorithm described in the previous block of the article, it is advisable to proceed to the formation of the Economic Security Index of the country using the principal component analysis (Tables 1, 2).

Table 1. Principal component analysis results (fragment)

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	5.697	2.206	0.228	0.228
Comp2	3.490	0.690	0.140	0.367
Comp3	2,800	0.467	0.112	0.479
Comp4	2.333	0.420	0.093	0.573
Comp5	1.913	0.514	0.076	0.649
Comp6	1,400	0.175	0.056	0.705
…	…	…	…	…
Comp25	0.035	.	0.001	1.000

Sources: developed by the authors.

In particular, according to the data in Table 1, it can be noted that 25 independent vectors were constructed within the PCA procedure. Still, more than 70% of the total variation of the indicators is explained by the first six principal components. The eigenvalues of the indicators for the quantitative assessment of the country's economic security were used for further determining the weighting coefficients of individual indicators (Table 2).

Table 2. Weighting coefficients calculation results

	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	AE	Ranking	WC
AgL	0.314	0.190	0.114	0.110	0.213	0.123	0.188	19	0.0585
AgVA	0.183	0.342	0.045	0.257	0.178	0.087	0.201	23	0.0708
CO2	0.091	0.440	0.215	0.124	0.074	0.040	0.189	21	0.0646
Branch	0.237	0.095	0.314	0.077	0.339	0.009	0.212	25	0.0769
CAB	0.127	0.123	0.089	0.439	0.043	0.299	0.164	10	0.0308
Dr	0.315	0.079	0.004	0.130	0.214	0.147	0.148	6	0.0185
CrD	0.232	0.185	0.131	0.056	0.023	0.406	0.125	4	0.0123
Empl	0.270	0.025	0.309	0.131	0.149	0.019	0.177	14	0.0431
FoodEX	0.150	0.257	0.167	0.005	0.364	0.162	0.189	20	0.0615
FoodIM	0.042	0.383	0.025	0.343	0.103	0.166	0.179	15	0.0462
FoodPro	0.065	0.100	0.169	0.300	0.125	0.430	0.152	7	0.0215
FDIn	0.030	0.384	0.146	0.163	0.089	0.132	0.162	8	0.0246
GDPg	0.076	0.004	0.179	0.200	0.360	0.066	0.164	9	0.0277
GGFCE	0.301	0.093	0.089	0.104	0.286	0.180	0.175	12	0.0369
Ginny	0.258	0.066	0.212	0.119	0.361	0.004	0.203	24	0.0738
GFCF	0.027	0.052	0.276	0.322	0.276	0.296	0.191	22	0.0677
Infl	0.116	0.025	0.205	0.232	0.278	0.073	0.171	11	0.0338
WatStr	0.213	0.132	0.016	0.060	0.153	0.248	0.115	2	0.0062
Lexp	0.246	0.129	0.086	0.372	0.045	0.348	0.176	13	0.0400
MilExp	0.077	0.180	0.169	0.158	0.016	0.062	0.12 0	3	0.0092
Portfolio	0.028	0.074	0.223	0.038	0.092	0.187	0.091	1	0.0031
RD	0.296	0.163	0.227	0.128	0.123	0.139	0.187	18	0.0554
Tax	0.278	0.195	0.003	0.149	0.074	0.185	0.139	5	0.0154
Res	0.180	0.165	0.397	0.066	0.095	0.136	0.181	16	0.0492
Trade	0.213	0.194	0.378	0.054	0.084	0.142	0.185	17	0.0523

Notes: PC – Principal Component; AE – Average Eigenvalue; WC – Weighting Coefficient.

Sources: developed by the authors.

Table 2 shows that for the selected 11 countries, the level of economic security of the state depends to the greatest extent on the density of the network of commercial banks, income distribution (the Gini coefficient), and the value added created by the agricultural sector. These individual indicators have the largest weighting

coefficients in the Country Economic Security Index. However, for this geographic sample, the least relevant determinants of the country's economic security are the inflow of portfolio investments, the level of water stress, and government military expenditures. Accordingly, these individual indicators have the lowest weighting coefficients.

At the next stage, the Economic Security Index (ESI) is formed by multiplying the appropriate weighting coefficient (column WC, Table 2) by the current normalized value of the individual indicator of a quantitative assessment of economic security for a specific country in a specific year, with their further convolution.

Table 3 presents the descriptive statistics in terms of the formed Economic Security Index and potential independent variables of the model.

Table 3. Descriptive Statistics

Variable	Observations	Mean value	Standard Deviation	Minimum value	Maximum value
ESI	176	0.512	0.026	0.46	0.58
Intel1	176	$3.71 \cdot 10^{8}$	$7.40 \cdot 10^{8}$	0	$3.73 \cdot 10^{9}$
Intel2	176	$6.21 \cdot 10^{7}$	$1.37 \cdot 10^{8}$	0	$1.10 \cdot 10^{9}$
ComEx	176	32.903	15.701	5.86	70.64
ComIm	176	38.141	15.884	11.23	77.66
Subscr	176	15.208	10.206	0.02	34.45
HTE	176	10.539	8.956	0.31	43.43
ICTGex	175	3.112	3.693	0	17.04
ICTGim	175	5.632	2.469	1.71	13.04
ICTSex	176	7.101	6.398	-1.19	33.29
ICTSim	176	$1.02 \cdot 10^{9}$	$1.71 \cdot 10^{9}$	$-1.40 \cdot 10^{9}$	$9.43 \cdot 10^{9}$
Internet	175	52.958	25.01	2.96	90.23
Patent1	176	317.16	723.576	1	4555
Patent2	176	932.955	1174.29	20	4676

Sources: developed by the authors.

Table 3 shows that Economic Security Index for 11 selected countries does not reach its maximum value (1). Still, its variation in the sample of countries is insignificant, which indicates the similarity of the economic development trends in these countries. It is worth noting that the maximum value of the Economic Security Index was recorded in 2006 in Kyrgyzstan, and the minimum value was recorded in 2014 in Belarus. In general, Belarus is characterized by the lowest level of economic security in the entire sample of countries during the entire observation period (2005-2021).

The next step of this study is the selection of independent variables of the model by calculating pairwise correlation coefficients. Based on the results of this stage, it was established that only 7 out of 13 potential innovative determinants presented in Table 3 meet the sufficiency criterion (only those innovative determinants characterized by at least a moderate correlation with the country's Economic Security Index were included in the next modelling stage). Thus, only the following innovative determinants were included in the next stage of the study:

- Charges for the use of intellectual property, receipts (BoP, current US$) (Intel2);
- Communications, computer, etc. (% of service imports, BoP) (ComIm);
- Fixed broadband subscriptions (per 100 people) (Subscr);
- High-technology exports (% of manufactured exports) (HTE);
- ICT goods exports (% of total goods exports) (ICTGex);
- ICT service exports (% of service exports, BoP) (ICTSex);
- Individuals using the Internet (% of the population) (Internet).

In the next step, there two models are built using the Pooled Mean Group Estimator in Stata 12/SE. One of which characterizes the impact of innovative determinants on the Economic Security Index of the country in the short term (up to 1 year) (Table 4) and the other – in the long term (Table 5).

Table 4. Short-run dependency coefficients

Variable	Coefficient	Standard Error	Z	P>|z|	Significance
Intel2	$6.58 \cdot 10^{-12}$	$1.67 \cdot 10^{-11}$	0.39	0.694	
ComIm	0.000212	0.000177	1.20	0.230	
Subscr	0.000820	0.000688	1.19	0.233	
HTE	0.000695	0.000367	1.90	0.058	**

Continued Table 4

Variable	Coefficient	Standard Error	Z	P>|z|	Significance
ICTGex	0.000789	0.000667	1.18	0.237	
ICTSex	0.002124	0.000546	3.89	0.000	***
Internet	0.000153	0.000359	0.43	0.670	

Sources: developed by the authors.

Table 5. Long-run dependency coefficients

Variable	Coefficient	Standard Error	Z	P>|z|	Significance
Intel2	$3.87 \cdot 10^{-11}$	$3.42 \cdot 10^{-11}$	1.13	0.257	
ComIm	0.000039	0.000671	0.06	0.953	
Subscr	0.001208	0.000859	1.41	0.160	
HTE	0.002132	0.001123	1.90	0.058	**
ICTGex	0.002277	0.003404	0.67	0.504	
ICTSex	0.001295	0.001169	1.11	0.268	
Internet	0.000294	0.000529	0.56	0.578	

Sources: developed by the authors.

It is fair to note that despite the inclusion in the models of only those innovative determinants characterized by at least a moderate correlation with the country's Economic Security Index, a statistically significant relationship between the variables of the model at one of the permissible confidence intervals (99%, 95% or 90%) was recorded only in a few cases, namely:

– in the short term: growth of 1% of high-technology exports to manufactured exports ratio leads to an improvement of the country's Economic Security Index by 0.000695 units, and a 1% increase in ICT service exports to total service exports ratio leads to an improvement of the country Economic Security Index by 0.001295 units with a 95% and 99% confidence probability, respectively;

– in the long term: a growth of 1% of high-technology exports to manufactured exports ratio leads to an improvement of the country's Economic Security Index by 0.002132 units with a 95% confidence probability. That is, the power of this innovative determinant increases over time;

– the influence of the remaining innovative parameters on ensuring the state's economic security in short- and long-term is positive but statistically insignificant and, therefore, cannot be considered relevant.

In addition, according to the modelling results, it could be noted that in the short term, the income from the use of intellectual property rights and the number of Internet users are completely irrelevant, but the increase in the import of computer equipment, Fixed broadband subscriptions, and export of ICT goods can be considered conditionally significant.

On the other hand, in the long term, growth in income from the use of intellectual property rights, Fixed broadband subscriptions, and export of ICT services is conditionally significant. At the same time, the rest of the innovative determinants are absolutely statistically insignificant.

The final stage of the research is determining the time lag (1-5 years), during which the power of the influence of high-technology exports to manufactured exports ratio impact on the Economic Security Index is the maximum. The simulation results are presented in Table 6.

Table 6. Regression results on High-technology exports to manufactured exports ratio impact on Economic Security Index (lag 1 year)

ESI	Coefficient	Standard Error	z	P>|z|	95% Confidence Interval		Significance
HTE	0.001109	0.000	3.67	0.000	0.002	0.001	***
Constant	0.523732	0.007	79.82	0.000	0.511	0.537	***

Sources: developed by the authors.

Thus, according to the data in Table 6, it could be noted that with a delay of 1 year, the statistical significance of the impact of High-technology exports to manufactured exports ratio impact the Economic Security Index is the maximum (confirmed with 99% confidence probability). In particular, it was established that with a delay of 1 year, the growth of 1% High-technology exports to manufactured exports ratio leads to an improvement of the country's Economic Security Index by 0.001109 units.

Conclusions. The results of the conducted research showed that, in general, a significant number of publications are devoted to the problem of a quantitative assessment of a country's level of economic security.

In these scientific, analytical, and regulatory documents, the components of the country's national security and the parameters of their quantitative assessment vary somewhat. Still, in general, this block of scientific work is almost exhausted, and the changes in it are not of a fundamental nature. At the same time, not so many studies are devoted to the determination of innovative determinants in the short- and long-term perspective for a specific group of countries, which determines the relevance of the research topic, as well as the scientific and practical value of the obtained results.

It is worth noting that in work, the Economic Security Index of the country was built by combining the minimax method of normalization, determining weighting coefficients, and additive convolution of 25 individual indicators characterizing resource, financial, macroeconomic, socio-demographic, food, investment, innovation, budget, foreign-economic perspectives of the country economic security. The value of the Economic Security Index for 2005-2021 for the selected 11 countries of the sample belongs to the range [0.46; 0.68]. At the same time, the maximum value of the Economic Security Index was recorded in 2006 in Kyrgyzstan, and the minimum value was recorded in 2014 in Belarus. Belarus is characterized by the lowest level of economic security in the entire sample of countries during the observation period.

According to the modelling results, it was established that for the selected 11 countries, innovative and technological development is not a significant determinant of ensuring the country's economic security in the short or long term. The only factor that positively affects the Economic Security Index of the state in both periods is the high-technology exports to manufactured exports ratio. Moreover, the strength of the positive influence of this indicator increases precisely in the long-term period (a 1% increase in this parameter leads to an increase in the dependent indicator by 0.000695 units and 0.002132 in the short- and long-term, respectively). Nevertheless, testing to identify a specific time lag (up to 5 years), in which the impact of high-tech exports on the economic security of the country is the most significant, proved that with a delay of 1 year, the statistical significance of the impact of High-technology exports to manufactured exports ratio impact on the Economic Security Index is the maximum (confirmed by 99% confidence probability). However, the coefficient characterizing this effect precisely with a delay of 1 year is almost twice as small as the similar coefficient in the long-term growth model (without specifying the lag). It leads to the conclusion that this innovative determinant has a stronger and statistically significant effect with a lag of 1 year; however, in the rest of the following periods, it also has a rather noticeable and positive effect. It makes it possible to achieve a positive cumulative and synergistic effect. In the context of characterizing the short-term impact of innovative factors on the growth of the country's economic security level, it is worth noting that a 1% increase in ICT service exports to total service exports ratio leads to an improvement in the country's Economic Security Index by 0.001295 units with a confidence level of 99%.

The obtained results prove the need to strengthen the role of innovative factors in ensuring the economic security of such countries as Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Poland, Romania, and Ukraine. Special attention should be paid to Belarus. At the same time, in these countries, the positive impact in both perspectives of high-tech exports has been confirmed. Therefore, it is worth focusing the attention of government officials on supporting this innovative vector at the proper level.

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Роль інноваційних детермінант у забезпеченні економічної безпеки держави

Ця стаття узагальнює аргументи та контраргументи в межах наукової дискусії з питання визначення інноваційних детермінант забезпечення економічної безпеки держави. У роботі узагальнено наукові підходи до визначення сутності та складових економічної безпеки держави. Більшість дослідників виділяє у складі

економічної безпеки держави ресурсну, фінансову, макроекономічну, соціально-демографічну, продовольчу, інвестиційно-інноваційну, бюджетну, зовнішньо-економічну безпеку. На основі узагальнення існуючих напрацювань сформовано набір найбільш релевантних індикаторів кількісного оцінювання економічної безпеки держави, що враховують бюджетні, боргові, інвестиційні та інші її виміри. Усі часткові індикатори формування інтегрального показника економічної безпеки держави нормалізовано з використанням мінімаксного методу. Інтегрування часткових індикаторів здійснено на основі адитивної згортки. З метою визначення інноваційних драйверів та інгібіторів забезпечення економічної безпеки держави сформовано набір індикаторів, що характеризують інноваційний потенціал держави. Визначення впливу інноваційних параметрів на економічну безпеку держави здійснено з використання інструментарію PMG у програмному продукті Stata 12/SE. Це дозволить формалізувати інноваційні детермінанти, що впливають на економічну безпеку держави як у коротко- (до 1 року), так і довгостроковій перспективі (понад 1 рік). Для тих змінних, щодо яких встановлено існування довгострокового зв'язку, проведено поглиблене дослідження з використанням дистрибутивно-лагового моделювання. Це дозволило виявити конкретні часові лаги запізнення відгуку інтегрального показника економічної безпеки держави на дія інноваційних детермінант. Дослідження проведено для 11 країн, серед яких Азербайджан, Білорусь, Естонія, Грузія, Казахстан, Киргизстан, Латвія, Литва, Польща, Румунія та Україна. Часовий горизонт дослідження охоплює період 2005-2020 рр. Результати проведеного дослідження можуть бути корисними науковцям, органам державної влади та місцевого самоврядування.

Ключові слова: економічна безпека країни, інноваційні детермінанти, стале державне управління, панельні дані, дистрибутивно-лагове моделювання.