

MECHANISMS OF NATIONAL SECURITY POST-PANDEMIC RECOVERY

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Abstract: The COVID-19 pandemic has necessitated a critical review of pre-pandemic instruments and mechanisms for ensuring national security to identify drivers and inhibitors that determine the sensitivity of social, environmental and economic perspectives of national security to shocks, such as a pandemic. The objective of this study is to identify internal determinants (among individual indicators of economic, social and environmental security) and external drivers and inhibitors (among parameters of good governance) which act as relevant impacts on the resilience of national security of the studied European countries in the context of global turbulence (such as the crisis caused by the coronavirus pandemic), as well as to formalize the most effective mechanisms and instruments of state interventions by the corresponding external and internal impacts. The algorithm for implementing the research goal involves the implementation of the following steps: 1) selection of indicators for quantitative assessment of the economic, social and environmental security of the state; 2) bringing individual indicators to a comparable form using the Savage formula and natural normalization; 3) integrating indicators into indices of economic, social and environmental security of the state through a complex combination of the principal components analysis, the Fishburne formula and additive-multiplicative convolution; 4) identifying cause-and-effect relationships between integral levels of economic, social and environmental security of the state and indicators of good governance using panel data regression modelling; 5) qualitative interpretation of the results obtained and formalization of mechanisms and instruments of state interventions that contribute to strengthening the relevant performance indicators. Empirical realization research was carried out on a sample of 34 European countries. Period of observation – 2000-2022 (or the latest available period). It was found that economic security is internally conditioned by GDP per capita growth and increased reserves in months of import and externally dependent on the quality of regulation. Such internal impacts as a reduction of the Gini index and an increase in secondary school enrolment determine the state's social security. It is also externally caused by the growth of regulatory quality and the rule of law. Environmental security mainly depends on internal determinants such as CO2 emissions and renewable energy share in total energy production, and it is externally conditioned by the growth of the rule of law. For each identified internal and external impact, relevant tools of state interventions are formalized.

Keywords: COVID-19, coronavirus disease, economic security, social security, environmental security, good governance

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1. Introduction. The intensification of globalization and integration processes has allowed for increased cooperation between countries, provoking rapid cross-border movement of labour and capital. At the same time, in conditions where economic barriers between countries are practically absent, the risk of disseminating destructive impulses increases significantly. The speed of "damage" to the world economy caused by global crises (for example, the global financial crisis or the COVID-19 pandemic) is quite rapid, and the consequences are extremely critical. Thus, according to international experts, the economic decline in the context of the pandemic, exacerbated by the war in Ukraine, is one of the most extensive in the last 40 years. That is why, in the context of the emergence of new challenges and threats of a global nature, an important task facing the world community is ensuring national security. The concept of "national security" is complex and multifaceted, which, in most cases, covers economic, social and environmental security. In turn, each of these components integrates a number of individual parameters that determine the vulnerability of national security to the destructive influence of various etymologies. In such conditions, an important empirical task is to identify internal and external relevant impacts that contribute to strengthening the resistance of national security to global shocks and formalize mechanisms and instruments of state interventions that will enhance their effect.

2. Literature Review.

A generalization of modern research results on the issues of ensuring the state's national security through the introduction of best practices of good governance has shown the lack of broad scientific interest in the specific issues, indicating the need for a more in-depth study of this issue. In particular, the work (Garofalo, 2015) investigated the relationship between national security and public values and governance. In particular, researchers note that introducing the principles of good governance should be more conscious and based on a holistic approach, and not exclusively an adaptation of certain principles that are part of the ideological strategy of state development. At the same time, Edeh & Ugwueze (Edeh & Ugwueze, 2014) empirically confirmed the positive relationship between good governance, economic growth and national security of the state. A separate group of researchers (Tang, 2015; Bornemann et al., 2024; Mathis et al., 2022; Termeer et al., 2024) emphasizes the importance of good governance in the context of ensuring the state's sustainable economic development and economic security. An equally important block of scientific interest in this issue is the study of the role of good governance in the development of human capital and strengthening the social security of the state (Musalem & Ortiz, 2011; Bonvin & Laruffa, 2022; Koch, 2022; Gjaltema et al., 2020; Schneider & Miess, 2024; Merkys et al., 2024). In addition, over the past two decades, research on the role of good governance in achieving state environmental targets has also become relevant (Hausknost & Hammond, 2020; Gjaltema et al., 2020; Rantala et al., 2023; Shahmoradi & Guimarães, 2024; Schneider & Miess, 2024; Patterson et al., 2017). However, research on these aspects is fragmentary, which indicates the need to deepen scientific research in this direction.

3. Methodology and research methods.

The purpose of this study is to identify internal determinants (among individual indicators of economic, social and environmental security) and external drivers and inhibitors (among parameters of good governance) that act as relevant impacts on the resilience of national security of the studied European countries in the context of global turbulence (such as the crisis caused by the coronavirus pandemic), as well as to formalize the most effective mechanisms and instruments of state interventions as appropriate external and internal impacts. The central hypothesis of this study is the assumption that government effectiveness, political stability, regulatory quality, rule of law, voice and accountability are significant external determinants of ensuring the state's economic, social and environmental security.

To test the hypothesis of this study and fulfil its task, it is necessary to implement several procedures:

- 1) selection of indicators for quantitative assessment of the economic, social and environmental security of the state;
- 2) bringing individual indicators to a comparable form using the Savage formula and natural normalization;
- 3) integration of indicators into indices of economic, social and environmental security of the state through a complex combination of the principal components analysis, the Fishburne formula and additive-multiplicative convolution;
- 4) identifying cause-and-effect relationships between the integral levels of economic, social and environmental security of the state and indicators of good governance using regression modelling on panel data;
- 5) qualitative interpretation of the obtained results and formalization of mechanisms and instruments of state interventions that contribute to strengthening the relevant performance indicators.

Empirical testing of the hypothesis was carried out on a sample of 34 European countries, namely Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Moldova, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom. Study period – 2002-2022 (or the latest available period). All data are collected from the World Development Indicators and Worldwide Governance Indicators collection of the World Bank Group (World Bank, 2024).

4. Results.

In previous studies by the authors (Vysochyna et al., 2023), the justification and implementation of stages 1-3 of this study were carried out based on the results of which the corresponding integral indicators were formed. Thus, the integral indicator of economic security can be presented as follows:

$$Econ_{sec} = 0.25 \cdot GDP_{pc} + 0.1 \cdot GGFC + 0.05 \cdot GCF + 0.15 \cdot Mil_{exp} + 0.2 \cdot Trade + 0.25 \cdot Res \quad (1)$$

where Econ_sec – integral indicator of economic security, units;
 GDP_pc – GDP per capita, current USD;
 GGFC – General government final consumption expenditure to GDP ratio, %;
 GCF – Gross capital formation to GDP ratio, %;
 Mil_exp – Military expenditure to GDP ratio, %;
 Trade – Trade to GDP ratio, %;
 Res – Total reserves in months of imports.

The social security of the state can be described by the following equation:

$$Soc_{sec} = 0.5 \cdot Empl + 0.25 \cdot Gini + 0.25 \cdot School \quad (2)$$

where Soc_sec – integral indicator of social security, units;
 Empl – Employment to population ratio, %;
 Gini – Gini index? Units;
 School – Secondary school enrollment, %.

In turn, the ecological security of the state can be represented as follows:

$$Env_{sec} = 0.1765 \cdot Water + 0.2353 \cdot CO2 + 0.1765 \cdot NO2 + 0.1176 \cdot Cons + 0.2353 \cdot Ren_{prod} + 0.0588 \cdot Loss \quad (3)$$

where Env_sec – integral indicator of environmental security, units;
 Water – Annual freshwater withdrawals, % of internal resources;
 CO2 – CO2 emissions, metric tons per capita;
 NO2 – Nitrous oxide emissions, thousand metric tons of CO2 equivalent;
 Cons – Electric power consumption, kWh per capita;
 Ren_prod – Electricity production from renewable sources, excluding hydroelectric, % of total;
 Loss – Electric power transmission and distribution losses to output ratio, %.

Taking into account the features of the algorithm for determining weight coefficients for the above-presented integral indicators of the components of the state's national security, it can be noted that the most relevant internal impacts (parameters with the highest weight coefficients) in the context of each of the components are the following:

- for the economic security of the state – growth in GDP per capita and reserves in months of import;
- for the social security of the state – a decrease in the Gini index and an increase in the level of secondary school education coverage ;
- for the environmental security of the state - reducing CO2 emissions and increasing the share of energy production from renewable sources.

Thus, these parameters act as internal impacts to ensure the growth of the relevant components of the state's national security and its resilience to shocks such as the COVID-19 pandemic.

In order to determine the external impacts of the resilience of the relevant components of the state's national security to global turbulence, a regression modelling process was implemented on panel data, where the effective variables are the integral indices of the state's economic, social and environmental security (represented by formulas 1, 2 and 3, respectively). The independent variables are good governance indicators. A set of simple regression equations was constructed on panel data to test the research hypothesis that the parameters of good governance are significant external determinants of ensuring the state's economic, social and environmental security. Based on the application of the Hausman test, it was determined that a regression model with random effects is more acceptable for this type of data. The modelling results are summarized in Table 1.

Based on the modelling results (Table 1), the following conclusions can be drawn:

- no statistically significant impact of the quality of regulation, voice and accountability on the environmental security of the state has been confirmed;
- an increase in government efficiency by 1 unit leads to a decrease in the integral index of environmental security by 0.0248 units with a 99% confidence probability;
- an increase in political stability by 1 unit is accompanied by a decrease in the level of environmental security by 0.0147 units with a 99% confidence probability;

- an increase of 1 unit in the estimated level of the rule of law causes an increase in the integral index of environmental security by 0.019 with a 95% confidence probability;

Table 1. Regression results on the impact of good governance indicators on environmental, social and economic security in 2000-2022 in 34 European countries

Variable	Env_sec		Soc_sec		Econ_sec	
	Coef.	p-value	Coef.	p-value	Coef.	p-value
GE	-0.0248	0.0002	0.0107	0.1211	-0.0208	0.0047
P.S.	-0.0147	0.0001	0.0020	0.6126	0.0001	0.9836
RQ	-0.0061	0.4015	0.0242	0.0012	0.0369	0.0000
RL	0.0190	0.0250	0.0347	0.0001	-0.0042	0.6423
VA	-0.0068	0.3929	-0.0279	0.0006	-0.0075	0.3867

Source: authors' calculations in Stata 14.2/SE software (Stata, 2024) based on World Bank data (World Bank, 2024)

GE – Government Effectiveness; PS – Political Stability and Absence of Violence/Terrorism; RQ - Regulatory Quality; RL – Rule of Law; VA - Voice and Accountability. Statistically significant drivers are shaded light gray, inhibitors – dark gray.

- changes in the state's social security do not depend on changes in government efficiency and political stability;
- an increase in the quality of regulation by 1 unit is accompanied by an increase in the integral index of social security of the state by 0.0242 units with a 99% confidence probability;
- an increase of 1 unit in the estimated level of the rule of law causes an increase in the integral index of social security of the state by 0.0347 with a 99% confidence probability;
- an increase of 1 unit in the level of accountability and transparency leads to a decrease in the integral level of social security of the state by 0.0279 units with a 99% confidence probability;
- the economic security of the state turned out to be the least sensitive to changes in the parameters of good governance: the existence of a statistically significant causal relationship between the integral index of the economic security of the state and political stability, the rule of law, and voice and was not confirmed;
- instead, it was found that the increase in the quality of regulation is a statistically significant driver of ensuring the economic security of the state: an increase in the independent variable by 1 unit is accompanied by an increase in the effective indicator by 0.0369 units with a 99% confidence probability;
- in turn, a statistically significant inhibitor of ensuring the state's economic security is government efficiency: an increase of 1 unit of the independent variable causes a reduction in the integral index of the economic security of the state by 0.0208 units.

Thus, it can be noted that in the context of strengthening the resilience of the state's national security, it is advisable to more actively and purposefully influence the improvement of the quality of regulation and the rule of law. In contrast, the negative impact of increasing government efficiency, political stability, and voice and accountability on individual components of the state's national security can be explained by the difficulty of absorbing the relevant transformations by the socio-economic systems of the studied countries. Thus, it can be assumed that in the selected countries, relevant state interventions aimed at improving government efficiency, political stability, accountability and transparency initially provoke a shock reduction in the indicators of the state's environmental, economic and social security, but after a certain period of adaptation, the trend becomes reversed, i.e. the relationship between the variables is not linear, but has a U-shaped shape.

5. Discussion.

Therefore, an important tool for ensuring GDP per capita growth is the adaptability of the country's economic system to structural shifts and labour market requirements. To understand the volatility trends of the economic environment, it is necessary to conduct periodic monitoring of market trends (quarterly and annual summary), as well as monitoring of demand and supply in the labour market (available vacancies and posted resumes). Tracking innovations in the global market and analyzing the volatility of demand and supply in the labour market will allow for the identification of those sectors of the economy and the vectors of their transformation that will be popular in the short and medium term. In turn, understanding these processes will allow for the formation of an effective step-by-step strategy for the structural modernization of the economy.

In addition, during the pandemic, the most resilient businesses were those that successfully combined technologies for remote work with offline work. In the current conditions of the emergence of new security threats caused by military operations in Ukraine, remote employment is an additional competitive advantage. The ability to perform work assignments remotely allows you to increase the productivity of employees, their motivation and save on costs for renting office space, etc. An alternative to remote employment is the introduction of a flexible schedule for performing tasks, which allows the employee to distribute their workload in accordance with their own needs and habits.

The need to ensure the growth of the reserves in months of import demonstrates the importance of the resilience of foreign trade operations. To ensure this task, an important tool is to promote diversification of both the commodity structure and the geographical origin of export-import operations. The existence of a motivated-diversified structure of trade operations will help reduce the risks of using these mechanisms to exert economic or political pressure on the country. At the same time, it is more expedient to form the geographical structure of trading partners from countries with more stable economic systems, if possible. This will avoid excessive risks of dissemination of crisis processes through this channel. Ensuring business guidance to comply with this strategy can be ensured through a combination of relevant state interventions - tax benefits, recommendations for optimizing the volume of trade operations, bilateral agreements between countries, etc.

The policy of ensuring the reduction of the Gini index is, on the one hand, the result of the effective implementation of the above-described economic intervention measures and, on the other hand, should be supported by specific measures of social protection of the population. To prevent the impoverishment of the population, it is advisable to actively use employment promotion tools through the provision of state grants for training in specialties for which there is a shortage of labour; popularization by means of social advertising of those areas where there is a need for personnel. On the other hand, in order to prevent excessive incomes, it is possible to use the tools of progressive taxation of personal income, in which the minimum wage can be taxed at a 0 rate, while with an increase in income, the share of income withheld in the form of tax would increase.

Among the mechanisms for ensuring the growth of secondary school education coverage, it is possible to introduce the mandatory nature of this step, as well as significantly limit the opportunities and prospects for those citizens who do not have secondary education. If the lack of education is due to objective factors (such as the lack of opportunities for study, etc.), then for such categories of citizens it is advisable to introduce special social programs with grant or state funding to eliminate the educational gap.

The policy of reducing CO₂ emissions is one of the most important priorities of the global community. That is why, to ensure this target, it is necessary to strictly adhere to the strategies, recommendations and guidelines defined at the supranational level. To eliminate the infrastructure obstacles to the transition to a "green" economy, it is necessary to actively develop state support programs in this direction, as well as use the potential of domestic and external donors.

To actively promote the growth of the share of energy production from renewable sources, it is necessary to clearly understand which of the renewable energy options has the greatest development potential in a particular country. Defining these priorities and a clear focus, combined with attracting domestic and external financing, will ensure the gradual development of this segment of the energy market. At the same time, to reduce the initial cost of investment in the development of renewable energy, it is possible to develop and introduce a set of tax breaks or tax exemptions for a certain period of time. In addition, it is important to actively support the development of scientific and technical developments in this area, since innovative technologies can reduce the cost of expanding "green" energy.

In addition, it was found that the components of national security are sensitive to the positive influence of such external impacts as the growth of the rule of law and the quality of regulation. It is worth noting that the majority of the countries studied in the sample are democratic countries that have a developed system of regulatory support and profess democratic values. At the same time, among the tools for promoting the further implementation of the rule of law, an important vector is the synchronization of the national regulatory framework in accordance with the best practices identified by international organizations; active implementation of anti-corruption initiatives, liberalization of socio-economic relations and strengthening mechanisms for protecting investor rights.

In the context of finding the most appropriate instruments to improve the quality of regulation, it is advisable to develop a comprehensive strategy that, on the one hand, takes into account the best practices of countries around the world in which the relevant regulatory instruments have proven their effectiveness, but with their adaptation to domestic conditions. At the same time, it is possible that certain regulatory mechanisms may be effective for one country, but much less effective for another country. That is why, on the other hand, this strategy should be focused on historical aspects of socio-economic development, and should also be flexible and adaptive.

6. Conclusions.

Therefore, the results of the study show that improving the resilience of the state's environmental security is ensured by such internal impacts as reducing CO₂ emissions and increasing the share of energy production from renewable sources, as well as by such external impacts as increasing the rule of law.

The social security of the state is most internally determined by the decrease in the Gini index and the increase in the level of secondary school education coverage, and externally determined by the increase in the quality of regulation and the rule of law.

The economic security of the state is most sensitive to such internal impacts as growth in GDP per capita and reserves in months of imports, as well as such external impacts as increased quality of regulation.

Given the fact that not all perspectives of good governance have been confirmed to have a statistically significant relationship with performance indicators, the main hypothesis of this study can be considered only partially confirmed.

Determined in the context of each relevant external and internal impact, will allow strengthening its resilience to future shocks, similar to the coronavirus pandemic.

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МЕХАНІЗМИ ПОСТПАНДЕМІЧНОГО ВІДНОВЛЕННЯ НАЦІОНАЛЬНОЇ БЕЗПЕКИ

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Пандемія COVID-19 спричинила необхідність критичного перегляду допандемічних інструментів та механізмів забезпечення національної безпеки з метою виявлення тих драйверів та інгібіторів, що визначають чутливість соціо-еколого-економічних параметрів до шоків, на кшталт пандемії. Завданням даного дослідження є визначення

внутрішніх детермінант (серед індивідуальних вимірників економічної, соціальної та екологічної безпеки) та зовнішніх драйверів і інгібіторів (серед параметрів належного врядування), що виступають релевантними імпактами резильєнтності національної безпеки досліджуваних європейських країн в умовах глобальних турбулентностей (як то криза, спричинена пандемією коронавірусної інфекції), а також формалізація відповідним зовнішнім та внутрішнім імпактами найбільш дієвих механізмів та інструментів державних інтервенцій. Алгоритм виконання мети дослідження передбачає реалізацію наступних кроків: 1) відбір індикаторів кількісного оцінювання економічної, соціальної та екологічної безпеки держави; 2) приведення індивідуальних індикаторів до співставного вигляду з використанням формули Севіджа та природної нормалізації; 3) інтегрування показників в індекси економічної, соціальної та екологічної безпеки держави шляхом комплексного поєднання методу головних компонент, формули Фішберна та адитивно-мультиплікативної згортки; 4) виявлення причинно-наслідкових зв'язків між інтегральними рівнями економічної, соціальної та екологічної безпеки держави та показниками належного врядування з використанням регресійного моделювання на панельних даних; 5) якісна інтерпретація отриманих результатів та формалізація механізмів та інструментів державних інтервенцій, які сприяють посиленню відповідних результативних показників. Емпірична реалізація дослідження здійснена на вибірці з 34 європейських країн. Період спостереження – 2000-2022. Встановлено, що економічна безпека внутрішньо найбільш обумовлена зростанням ВВП на душу населення та збільшення резервів у місяцях імпорту, в зовнішньо залежна від якості регулювання. Соціальна безпека держави визначається таким внутрішніми імпактами як зниження індексу Джирні та збільшення охоплення середньою освітою, а зовнішньо обумовлена - зростанням якості регулювання та верховенства права. Екологічна безпека найбільш залежить від таких внутрішніх детермінант як викиди CO₂ та частка відновлювальної енергетики, а зовнішньо обумовлена зростанням верховенства права. Для кожного з визначених внутрішніх та зовнішніх імпактів формалізовано відповідні їм інструменти державних інтервенцій.

Ключові слова: COVID-19, коронавірусна хвороба, економічна безпека, соціальна безпека, екологічна безпека, належне врядування