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## EXOGENIC AND ENDOGENIC FACTORS OF THE RESILIENCE OF THE REGIONAL ECONOMIC SYSTEM

## ЕКЗОГЕННІ ТА ЕНДОГЕННІ ЧИННИКИ РЕЗИЛЬЄНТНОСТІ ЕКОНОМІЧНОЇ СИСТЕМИ РЕГІОНУ

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The article is devoted to the study of exogenous and endogenous factors of resilience of the regional economic system. It is emphasized that under conditions of global crises, regional economic systems must demonstrate a high level of adaptability, flexibility, and the capacity for rapid recovery after external and internal shocks. A number of exogenous and endogenous factors of resilience of the regional economic system are identified, and the endogenous and exogenous capacities of the region are examined. It is noted that the endogenous capacity of a region is the ability of the regional economic system to ensure its development through internal resources and potential. It is determined that exogenous capacity is the ability of the regional economic system to effectively respond to external influences and challenges and to utilize external opportunities in order to ensure the economic development, stability, and adaptation of the region. A clustering of the regions of Ukraine according to indicators characterizing the resilience of the economic system is carried out.

**Keywords:** resilience, endogenous factors, exogenous factors, region, economic system, global environment.

Стаття присвячена вивченню екзогенних та ендогенних чинників резильєнтності економічної системи регіону. Наголошено, що поняття резильєнтності у процесі наукового пошуку розглядається на різних рівнях і сьогодні активно використовується в економічній науці. Окреслено поняття “резильєнтності економічної системи регіону” як здатності протистояти кризам і зовнішнім шокам, швидко адаптуватися до змін та відновлюватися, зберігаючи стабільний соціально-економічний розвиток. Наголошено, що в умовах дії глобальних криз регіональні економічні системи мають демонструвати високий рівень адаптивності, гнучкості та спроможності швидкого відновлення після зовнішніх і внутрішніх шоків. Розглянуто роль характеристик абсорбції,



адаптації і трансформації у процесі забезпечення резильєнтності економічної системи. Виділено низку екзогенних та ендогенних чинників резильєнтності економічної системи регіону, а також розглянуто ендогенну та екзогенну спроможність регіону. Зазначено, що ендогенна спроможність регіону є здатністю регіональної економічної системи забезпечувати свій розвиток через внутрішні ресурси і потенціал за рахунок низки ендогенних чинників, зокрема інноваційна екосистема, диверсифікація економіки, соціальний капітал, інституційна стійкість, цифрова трансформація тощо. Визначено, що екзогенна спроможність є здатністю економічної системи регіону ефективно реагувати на зовнішні впливи та виклики і використовувати зовнішні можливості для забезпечення економічного розвитку, стійкості та адаптації регіону. Проаналізовано європейський досвід забезпечення економічної стійкості на регіональному рівні. Методологічну основу дослідження становлять системний підхід, порівняльний і кластерний аналіз, методи аналіз та синтезу для виявлення та узагальнення екзогенних та ендогенних чинників резильєнтності економічної системи регіону. Наголошено на важливості формування регіонального економічного потенціалу для забезпечення резильєнтності економічної системи. Проведено кластеризацію регіонів України за показниками, що характеризують резильєнтність економічної системи. Практична цінність статті розкривається у визначенні низки екзогенних та ендогенних чинників резильєнтності економічної системи регіону у сучасному глобальному середовищі.

**Ключові слова:** резильєнтність, ендогенні чинники, екзогенні чинники, регіон, економічна система, глобальне середовище.

**Statement of the problem.** The relevance of issues related to the study of exogenous and endogenous factors ensuring the resilience of the regional economic system is обусловлена the instability of the global economic environment, where financial crises, geopolitical conflicts, technological transformations, and environmental challenges arise. Under such circumstances, regional economic systems must demonstrate a high level of adaptability, flexibility, and the capacity for rapid recovery after external and internal shocks. In the context of global crises, including economic, energy, environmental, and security challenges, a comprehensive understanding of the interaction between exogenous and endogenous factors becomes particularly important, as it makes it possible to identify directions for strengthening the economic resilience of regions, ensure adequate adaptation to transformations in the external environment, and create the prerequisites for sustainable socio-economic development.

**Analysis of recent research and publications.** The concept of resilience in scientific research is presented at different levels. Thus, S. Potapov considers resilience at the individual, family, and societal levels. Psychological resilience is evaluated as an individual's ability to overcome difficulties and stress while maintaining psychological stability and integrity [1, p. 93]. O. Kredentser studies the issue of resilience at the level of the organization, group (team), and individual (personnel), characterizing it as the ability to withstand adversity, recover from it, and use the experience gained [2, p. 133]. Economic resilience is considered as the ability of national economies to restore their capacity to reach the optimal

level of functioning through their own financial, material, and production capabilities [3, p. 318]. However, the issue of regional resilience and the factors ensuring it under conditions of resistance to external shocks remains particularly relevant for the formation of effective regional policy and the preservation of sustainable development of the state.

**Highlighting previously unresolved parts of the overall problem.** Objectively, regions differ in terms of economic development level, resource potential, economic structure, and social infrastructure; accordingly, their ability to withstand crisis phenomena and quickly recover after shocks also differs. Today, global challenges such as economic crises, military conflicts, pandemics, energy, and environmental problems have an unequal impact on different territories, and the study of regional resilience makes it possible to identify the most vulnerable regions and develop effective support mechanisms for them. A clear understanding of regional resilience contributes to the development of effective regional policy and ensures balanced spatial and sustainable development of the country. Thus, studying resilience at the regional level allows for a deeper understanding of the mechanisms of territorial adaptation to crisis conditions and the formation of effective strategies for their socio-economic development.

**Formation of the objectives of the article (task statement).** The purpose of the article is to determine the directions for ensuring the resilience of the economic system of the region based on taking into account the action of a number of exogenous and endogenous factors.

**Summary of the main research material.** The concept of resilience has entered the economic domain. Thus, economic resilience

is a characteristic that reflects the ability of an economic system to adapt to existing changes and promptly restore its functions following adverse impacts. It differs from stability, which is associated with the system's ability to withstand external shocks and maintain equilibrium without significant transformations. A resilient economy is simultaneously characterized by three properties: absorption, adaptation, and transformation.

Absorption is manifested in the ability of economic systems to absorb the consequences of shocks and disturbances, including financial crises, natural disasters, and socio-political changes.

Adaptation concerns the processes through which the economy responds to transformations and challenges while adjusting its strategies; it may involve diversification of production, changes in employment policy, and the implementation of innovations in order to maintain the competitiveness of economic agents.

Transformation is associated with deep and structural changes in the economy resulting from long-term challenges or shocks. These include the implementation of more sustainable development models (for example, the "green" economy or digitalization), which enable the economy not only to recover but also to continue its development [4, p. 79].

V. Khaustova and O. Reshetnyak, in their research, emphasize the post-event nature of resilience and the ability of an economic system to absorb shocks, mitigate losses, and restore its state due to its internal adaptive properties after the impact of various shocks. They also identify two groups of supporting factors within the system itself: 1. natural factors of the economic system, such as the structure of the economy, trends in its development, resource potential, the ability to substitute lost resources and redistribute available ones, characteristics of the labor market, etc.; 2. acquired factors that characterize the adaptability of the economic system, in particular the ability to mitigate the consequences of shocks and crisis situations by making additional efforts, for example through public policy, the national innovation system, and available financing [5, p. 32].

A. Gvesiani and V. Chernichenko interpret the resilience of a socio-economic system as the ability to absorb shocks, adapt to changes, and restore functions after the loss of stability and a period of crisis. It follows that a socio-economic system is resilient when it demonstrates the

capacity for recovery and further development after the loss of stability caused by shocks or disasters. In their view, the absorption capacity describes the ability to minimize the impact and sensitivity to shocks or stressful situations through the implementation of a set of measures and appropriate strategies. The adaptation capacity refers to the ability to make well-grounded decisions and modify livelihood strategies in response to long-term changes of various origins. The transformation capacity is considered the ability to initiate changes aimed at ensuring greater resilience in the strategic perspective [6, p. 8].

Thus, in our view, when studying the resilience of the regional economy, it is important to consider both its internal (endogenous) and external (exogenous) aspects. Endogenous factors, including the structure of the regional economy, the level of innovation potential, the quality of the institutional environment, human capital, and the effectiveness of governance, determine the internal capacity of a region to withstand crisis phenomena. That is, when referring to endogenous capacity, it is the ability of a region to use its own resources (human capital, innovation, institutions, natural resources) for self-recovery. In combination with resilience (stability and flexibility), it enables the economic system not merely to survive during crises but also to transform. In our opinion, the key components of such a system are:

- Innovation ecosystem, which involves the creation of local value chains that are less dependent on global ones.
- Economic diversification, understood as a shift away from narrow specialization toward the development of multiple sectors, which minimizes risks.
- Social capital, manifested as the level of trust and interaction between government, business, and the community, enabling the rapid adoption of rational decisions under conditions of instability.
- Institutional resilience, understood as effective local governance capable of adapting development strategies to new realities, for example energy independence.
- Digital transformation, which ensures continuous and efficient operation and governance, becoming especially important during pandemics or military conflicts.

Thus, regions that are characterized by autonomous life-support mechanisms and the capacity for rapid internal mobilization will be in a more advantageous position.

However, the exogenous capacity of a region is no less important. It is understood as the ability to respond quickly and effectively to flows of external influences and challenges, including global crises, international markets, technological transformations, and political factors, as well as to utilize external opportunities to ensure the economic development, stability, and adaptation of the region. The main exogenous factors include:

- Global economic processes and the overall geopolitical situation. This includes changes in the world economy, fluctuations in global markets, international competition, the movement of human capital, global financial crises, as well as international conflicts or political instability.

- International trade and foreign economic relations, which involve the degree of access to external markets, the existence of trade restrictions, the imposition of sanctions, and transformations in global supply chains.

- Global technological trends, manifested through global digitalization, personalization, innovative activity, and the transfer of new technologies.

- International financial support and investment, referring to inflows of foreign capital, the receipt of grants, and the provision of loans by international financial organizations.

- Large-scale environmental and climate changes, among which the most common are natural disasters, climate change, and international environmental requirements and standards.

- Global politics and the contemporary regulatory environment, including established rules of international trade, integration processes, and the requirements of international institutions.

Thus, exogenous factors create the external environment in which the regional economy functions and largely determine its ability to adapt to global challenges, enhance resilience, and ensure long-term development. Therefore, it is possible to speak of both the endogenous and exogenous capacity of the regional economic system in the context of ensuring its resilience.

As European experience shows, ensuring economic resilience involves establishing partnership relations between EU institutions and national and regional institutions in accordance with the principle of active subsidiarity, taking into account territorial diversity and recognizing the value of decentralization. For example, today, in the context of sustainable development, regions and cities are responsible for implementing

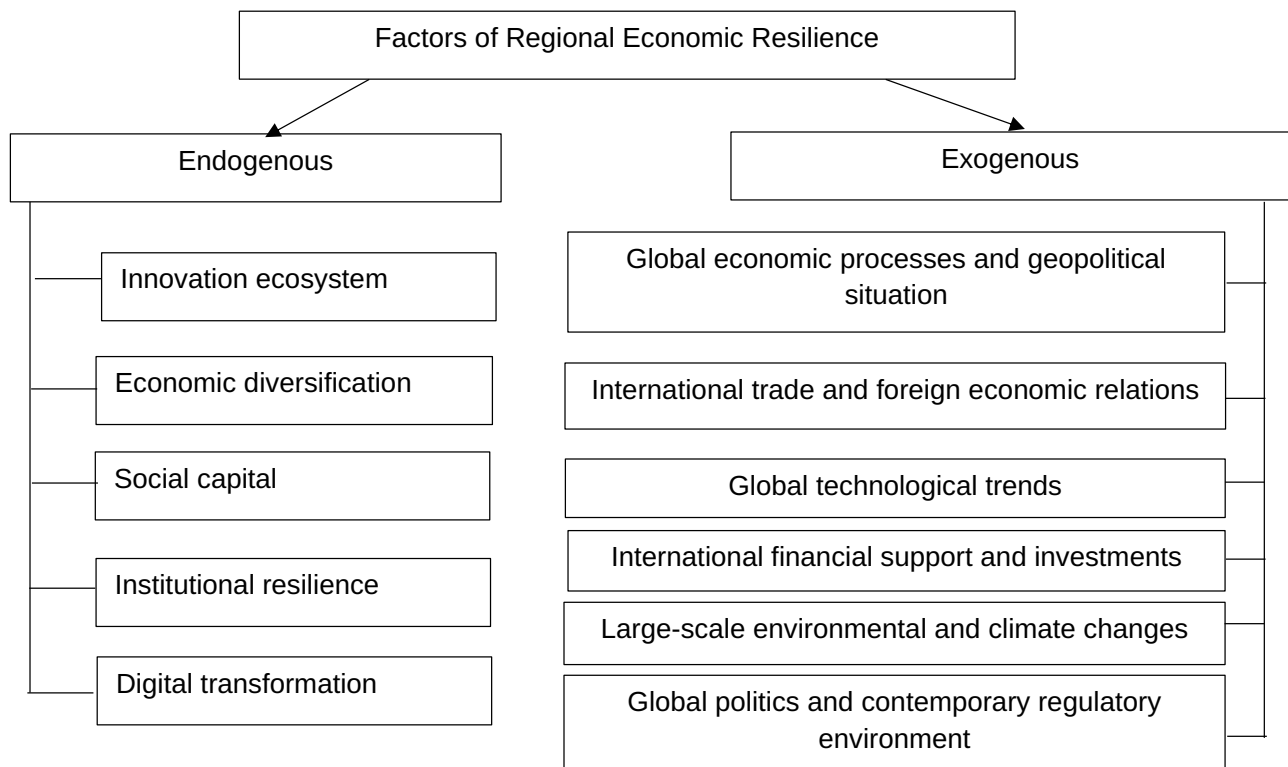
policies on climate change mitigation and climate adaptation, addressing social and gender inequality, reducing pollution, preserving biodiversity, and protecting natural resources. They also play a key role in the energy sector, improving efficiency and integrating renewable energy sources. Regions act as key drivers of the circular economy in Europe.

To ensure competitiveness in the strategic dimension, measures are envisaged for regions and cities to connect to digital platforms and data processing centers. They are also expected to promote startup innovations in the field of artificial intelligence, while enhancing cybersecurity to protect innovative solutions. In addition, strengthening the role of regions in the management of the Common Agricultural Policy based on regional strategies for food security and rural development is envisaged [7].

As a result of an empirical study conducted by foreign researchers, it has been established that high-productivity regions, typically urban, innovation-intensive, and with well-aligned skills, are more likely to achieve high levels and sustainable growth of competitive and sustainable economic activity. For such regions, it is important to support innovation momentum and sectoral transformations, for example decarbonization of production or digitalization of services [8].

It can be agreed that the process of forming regional economic potential is of significant importance for ensuring resilience [9, p. 46]. This process encompasses entrepreneurial potential and conditions for the development of small and medium-sized enterprises; the development of education and science and the formation of human capital; the formation of a system for the provision of social services; the development of regional infrastructure; the expansion of integration links between regions; investment support for regional development; scientific, innovative, and technological development; and the implementation of the principles of the circular economy.

The resilience of the regional economic system can be studied based on a set of indicators that reflect the ability of a region to adapt to shocks. To conduct a cluster analysis of the regions of Ukraine according to indicators characterizing the resilience of the economic system, we used annual values for 2024 by oblasts of Ukraine for the following indicators: capital investment, exports of goods, exports of services, the volume of sold products (goods and services) of enterprises, net profit of enterprises, the number



**Figure 1. Exogenous and Endogenous Factors of Resilience of the Regional Economic System**

*Source: compiled by the authors*

of innovation-active industrial enterprises, and the number of active business entities.

The results of the cluster analysis in 2024 are presented in Table 1. The clustering was carried out using the k-means method, which made it possible to group oblasts according to the level of similarity of their characteristics. As a result of the analysis, three clusters were formed, reflecting different types of regional economic resilience.

The first cluster – “metropolitan center of economic resilience” – is represented exclusively by Kyiv. The allocation of the capital into a separate cluster is explained by the significant difference in its socio-economic parameters compared to other regions of the country. Kyiv is characterized by a high concentration of entrepreneurial activity, significant volumes of investment, a high level of average wages, developed infrastructure, and a substantial share in the formation of foreign trade flows. Such characteristics form a specific model of regional resilience, based on the dominance of the service sector, the financial sector, and the administrative functions of the national economy.

The second cluster – “regions of increased economic activity and structural resilience” – includes Dnipropetrovsk, Kyiv, Lviv, and Kharkiv

oblasts. These regions are characterized by a relatively high level of economic development, significant industrial and innovation potential, and a developed entrepreneurial infrastructure. Dnipropetrovsk and Kharkiv oblasts traditionally act as important industrial centers of the country, while Lviv and Kyiv oblasts demonstrate a considerable diversification of the economic structure, combining industrial production, the service sector, and active foreign economic activity. The relatively small distances of the objects from the cluster centers indicate a high degree of homogeneity of these regions according to the studied indicators.

The third cluster – “regions of basic economic resilience” – is the most numerous and covers the majority of oblasts of Ukraine. It includes Vinnytsia, Volyn, Donetsk, Zhytomyr, Zakarpattia, Zaporizhzhia, Ivano-Frankivsk, Kirovohrad, Luhansk, Mykolaiv, Odesa, Poltava, Rivne, Sumy, Ternopil, Kherson, Khmelnytskyi, Cherkasy, Chernivtsi, and Chernihiv oblasts. These regions are characterized by a more moderate level of socio-economic development and varying degrees of diversification of the economic structure. Some of them have an agrarian specialization, while others combine industrial production with the development of

Table 1

**Clustering of the oblasts of Ukraine according to indicators characterizing regional resilience in 2024 using the k-means method**

Cluster number	Objects included in the cluster	Distance of the object from the center of the corresponding cluster
Cluster 1 – metropolitan center of economic resilience	Kyiv (city)	0,00
Cluster 2 – regions of increased economic activity and structural resilience	Dnipro	0,615022
	Kyiv	0,409044
	Lviv	0,205442
	Kharkiv	0,460287
Cluster 3 – regions of basic economic resilience	Vinnitsia	0,331048
	Volyn	0,077639
	Donetsk	0,151924
	Zhytomyr	0,057873
	Zakarpattia	0,194047
	Zaporizhia	0,122542
	Ivano-Frankivsk	0,093160
	Kirovohrad	0,108107
	Luhansk	0,120721
	Mykolaiv	0,159975
	Odesa	0,552272
	Poltava	0,234143
	Rivne	0,173828
	Sumy	0,142561
	Ternopil	0,429649
	Kherson	0,432045
	Khmelnyskiy	0,099495
	Cherkasy	0,128106
Chernivtsi	0,263432	
Chernihiv	0,093344	

*Source: compiled by the authors based on [10]*

the service sector. At the same time, they are united by the relative proximity of the values of indicators characterizing the resilience of the economic system, which determined their grouping into a common cluster.

Thus, the results of the clustering indicate the existence of differentiation among the regions of Ukraine in terms of resilience levels. The identification of distinct types of regions allows for a clearer understanding of the specific features of their development and can be used to formulate a differentiated regional policy aimed at strengthening the resilience of economic systems.

Therefore, in order to ensure the resilience of the regional economy, it is important to consider the influence of a number of exogenous and endogenous factors, to develop its economic potential, and to study international experience, particularly European practices.

**Conclusions.** Resilience is generally considered as a concept, phenomenon, capability, and system characteristic. The resilience of the regional economic system is understood as the ability of the regional economic system to withstand crises and external shocks, quickly adapt to changes, and recover while maintaining stable socio-

economic development. Accordingly, the study of exogenous and endogenous factors in the formation of a resilient regional economic system is an important scientific and practical task, as it contributes to the development of effective mechanisms for strengthening the resilience of the regional economy and its ability to respond to contemporary global challenges.

The endogenous capacity of a region is its ability to ensure development through internal resources and potential, in particular human capital, innovation, entrepreneurship, natural resources, and the institutional environment. It reflects the ability of a region to independently generate economic growth, increase competitiveness, and adapt to changes based on its own internal capabilities. Endogenous factors include the innovation ecosystem, economic diversification, social capital, institutional resilience, digital transformation, etc.

The exogenous capacity of a region is its ability to effectively respond to external influences and

challenges and to utilize external opportunities to ensure economic development, stability, and regional adaptation. It is manifested in the region's ability to integrate into external economic processes, attract investments, technologies, and resources, and minimize the negative impact of external shocks. Exogenous factors include global economic processes and the geopolitical situation, international trade and foreign economic relations, global technological trends, international financial support and investment, large-scale environmental and climate changes, global politics, and the contemporary regulatory environment.

The clustering of the oblasts of Ukraine according to indicators characterizing regional resilience in 2024 using the k-means method made it possible to identify three groups of regions: the metropolitan center of economic resilience, regions of increased economic activity and structural resilience, and regions of basic economic resilience.

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