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Entrepreneurial Ecosystems for Post-War Economic Recovery: The Ukrainian Experience

Abstract

The relevance of this study is determined by the need to reconsider the role of entrepreneurial ecosystems in ensuring regional economic resilience under conditions of prolonged military shock and post-crisis recovery. In Ukraine, regional entrepreneurial ecosystems function not only as generators of employment and investment activity but also as mechanisms supporting socio-economic stability and the resilience of food systems. However, the scientific literature lacks systematic empirical assessments of how the internal relationships between ecosystem components change during structural disruptions. The aim of the study is to identify the nature and magnitude of transformations in the interrelationships between key parameters of Ukrainian regional entrepreneurial ecosystems during the military shock and early recovery period (2018–2024). The methodological framework combines descriptive statistics, interperiod comparison, and correlation analysis based on aggregated "region–year" data. The results show statistically significant declines in the main ecosystem indicators during 2022–2024 compared with 2018–2021: the number of SMEs decreased by 10.4%, employment by 15.3%, capital investment by 42.0%, and innovation activity by 22.5%. Correlation analysis also reveals a weakening of relationships between entrepreneurial activity, employment, and investment, indicating reduced structural coherence of ecosystems.

These findings demonstrate that post-war recovery policies should focus not only on restoring quantitative indicators but also on rebuilding systemic connections between ecosystem components in order to ensure long-term regional development and food security.

Keywords: *entrepreneurial ecosystem, post-war recovery, regional development, small business, investment activity, innovation activity, food security*

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Müharibədən sonra iqtisadi bərpa üçün sahibkarlıq ekosistemləri: Ukrayna təcrübəsi

Xülasə

Bu tədqiqatın aktuallığı davam edən hərbi şok və post-böhran bərpası şəraitində regional iqtisadi dayanıqlığın təmin edilməsində sahibkarlıq ekosistemlərinin rolunun yenidən qiymətləndirilməsi zərurəti ilə müəyyən edilir. Ukraynada regional sahibkarlıq ekosistemləri yalnız məşğulluq və investisiya fəaliyyətinin formalaşdırıcısı kimi deyil, həm də sosial-iqtisadi sabitliyi və ərzaq sistemlərinin dayanıqlığını dəstəkləyən mexanizm kimi çıxış edir. Bununla belə, elmi ədəbiyyatda struktur pozuntular zamanı ekosistem komponentləri arasındakı daxili əlaqələrin necə dəyişdiyini sistemli şəkildə empirik qiymətləndirən tədqiqatlar kifayət qədər deyil.

Tədqiqatın məqsədi 2018–2024-cü illəri əhatə edən müharibə şoku və erkən bərpa dövründə Ukraynanın regional sahibkarlıq ekosistemlərinin əsas göstəriciləri arasındakı qarşılıqlı əlaqələrin xarakterini və miqyasını müəyyən etməkdir. Metodoloji yanaşma aqreqasiya olunmuş "region–il" məlumatları əsasında təsviri statistika, dövrlərarası müqayisə və korrelyasiya analizini özündə birləşdirir.

Nəticələr göstərir ki, 2022–2024-cü illərdə 2018–2021-ci illərlə müqayisədə əsas ekosistem göstəricilərində statistik əhəmiyyətli azalmalar baş vermişdir: kiçik və orta müəssisələrin sayı 10.4%, məşğulluq 15.3%, kapital investisiyaları 42.0%, innovasiya fəaliyyəti isə 22.5% azalmışdır. Korrelyasiya analizi sahibkarlıq fəaliyyəti, məşğulluq və investisiya arasındakı əlaqələrin zəiflədiyini göstərir ki, bu da ekosistemlərin struktur bütövlüyünün azalmasına işarə edir.

Bu nəticələr göstərir ki, müharibədən sonrakı bərpa siyasətləri yalnız kəmiyyət göstəricilərinin bərpasına deyil, həm də ekosistem komponentləri arasındakı sistem əlaqələrinin yenidən qurulmasına yönəlməlidir. Bu isə uzunmüddətli regional inkişafın və ərzaq təhlükəsizliyinin təmin edilməsi üçün vacibdir.

Açar sözlər: *sahibkarlıq ekosistemi, müharibədən sonrakı bərpa, regional inkişaf, kiçik biznes, investisiya fəaliyyəti, innovasiya fəaliyyəti, ərzaq təhlükəsizliyi*

Introduction

Post-war economic recovery emerges most institutional, industrial and spatial imbalances that make difficult the restoration of entrepreneurship and sustainable regional development. New configuration of the economic environment infrastructure is being formed because production infrastructure has been destroyed; migration processes have taken place; logistics chains are broken; resources are redistributed within which business entities operate under conditions of extreme uncertainty. Despite increasing interest in the concept of entrepreneurial ecosystems as a tool for business support an d structural modernization, it still remains unclear what happens to such ecosystems during military shock an d early reconstruction period, how internal connections get transformed an d whether they can ensure economic recovery or even maintain food security This very uncertainty forms scientific problem which needs comprehensive analysis on functional capacity of entrepreneurial ecosystem s i n post war context.

In contemporary research, entrepreneurial ecosystems are interpreted as complex multi-level entities, whose effectiveness is determined not only by the presence of individual actors, but above all by the quality of coordination between institutional, social, and resource components. In this context, Leendertse et al. (2022) proposed an analytical framework for measuring entrepreneurial ecosystems, emphasizing the need for clear operationalization of indicators and the rejection of the declarative use of the term “ecosystem” without empirical content. This approach creates a methodological basis for empirical research in which the ecosystem logic of analysis must be confirmed by measurable parameters and intercomponent relationships.

Moritz et al. (2024) systematized the results of research on entrepreneurship in countries that have experienced armed conflicts within the broad topic of post-conflict issues. They record an increase in publications while also noting “the fragmentary nature of the empirical base and dominance of individual cases which hinders attempts at making generalized conclusions regarding entrepreneurial ecosystems in crisis environments.” The logic path followed by Fathallah et al. (2026) is similar to theirs-in their work, entrepreneurial ecosystems are viewed as a tool for economic recovery under fragile post-war conditions with emphasis placed on the role played by support organizations for entrepreneurs-but questions related to quantitative diagnosis about actual state/shock period remain unanswered.

Systematic understanding of the Ukrainian context has only begun to emerge. For the first time, Belitski et al. (2024) empirically evidenced specific institutional constraints and structural imbalances within entrepreneurial ecosystems in a region functioning under war conditions, thus marking the beginning of systematic understanding of the Ukrainian context. Diligach and Stavtskyy (2024) analyze sustainability factors for micro-, small-, and medium-sized businesses in Ukraine wherein they find business adaptability at firm level connected with ecosystem support involving broader economic recovery objectives related to food security. Most existing studies either provide qualitative analysis on selected aspects or offer nationwide assessments; hence there is need for a systematic regional analysis capable of integrating wartime structural transformation empirical assessment with ecosystem theory.

Despite the growing number of studies on entrepreneurial ecosystems and post-conflict development, significant conceptual and empirical gaps remain in the scientific literature. Most of the work is general or review in nature and is based on a limited number of cases, which makes it difficult to extrapolate the findings to other national and regional contexts. Particularly under-researched is the question of how the structural elements of entrepreneurial ecosystems – the entrepreneurial base, the labor market, investment flows, and innovation activity – interact in a state of prolonged military shock and whether they maintain systemic coherence in crisis conditions. The absence of such diagnostics limits the ability to assess not only the scale of losses, but also the depth of transformation of the internal connections of the ecosystem.

In addition, most studies consider the Ukrainian experience in a fragmented way – either through the prism of individual institutional decisions or through the analysis of business resilience without integrating these aspects into a holistic ecosystem framework. The regional dimension remains insufficiently explored, in particular the issue of interregional asymmetry of the war's impact and its consequences for the functional connectivity of ecosystems. At the same time, it is precisely the regional level that is key to understanding the spatial imbalances of recovery, the differentiation of entrepreneurial activity, and the potential for food security. Thus, there is a need to combine the theoretical concept of entrepreneurial ecosystems with a quantitative assessment of their actual state and transformation during the war period at the regional level.

The aim of the study is to conduct a comprehensive analysis of the role of entrepreneurial ecosystems in post-war economic recovery processes, with a focus on the Ukrainian experience and their importance for ensuring sustainable development and food security. Unlike studies that focus on individual indicators or cases, this study aims to identify changes in the configuration of relationships between key components of the ecosystem in the pre-war and war periods.

To achieve this goal, the following tasks are planned: to analyze theoretical approaches to the interpretation of entrepreneurial ecosystems in a post-conflict context and to summarize scientific approaches to the study of entrepreneurship in conditions of war and post-war transformation; justify the feasibility of regional-level analysis as an analytical framework for studying the transformation of entrepreneurial ecosystems; conduct a quantitative assessment of the dynamics of the basic parameters of entrepreneurial ecosystems in the pre-war and war periods; analyze the transformation of statistical relationships between entrepreneurial activity, employment, investment, and innovation in conditions of war shock; assess the potential of entrepreneurial ecosystems to support economic recovery and strengthen food security, taking into account the identified structural changes.

Literature Review

Increasingly, entrepreneurial ecosystems are viewed as a systemic infrastructure for recovery rather than a supporting element of economic policy. Therein structural transformation technological modernization and innovation become integrated driving forces, not standalone means or tools. According to Tsymbal and Kaleniuk (2024), this is techno-structural synergy wherein infrastructural innovations fast track economic recovery while correcting accumulated structural imbalances exacerbated by military shock. However, at the level of applied policy Zaichenko and Bondar (2025) show that effectiveness of business support during wartime depends on alignment between national instruments with international approaches thus effectively shifting discussion from an ecosystem based logic coordination towards sectoral support.

Current theory moves away from a set of descriptive characteristics and focuses on explanatory models that would be best suited to account for the network nature of interactions. Scott et al. (2022) provide justification for such a network-oriented approach in which, as they state, 'the effectiveness of ecosystems is determined by the quality…horizontal and vertical connections, configuration of resources, and ability to coordinate'. This logic at the policy level reflects recent approaches toward so-called 'policy mixes' where it is not individual instruments that matter but their interaction: Wang et al. (2023) find contextualized evidence regarding an appropriate mix or combination between regulatory, financial, and institutional mechanisms. Wei (2022) adds to this by showing that in a low institutional capacity environment, regional governments can also catalyze opportunity

entrepreneurship-but only if policies are coordinated and there is administrative capacity to implement them. For post-war Ukraine, coherency between components of the entrepreneurial ecosystem] therefore implies that the quality of coordination becomes a critical condition for restoring ecosystem functionality.

Institutional quality and sustainability orientation of the ecosystem is another dimension in a post-conflict environment. As illustrated by Audretsch et al. (2024), institutional parameters may sometimes enhance the impact pathway between entrepreneurial orientation toward sustainability, leaving some room for unexpected effects on performance. According to Campos-Blázquez et al. (2024), through open innovation policies, the government can reinforce horizontal linkages and knowledge diffusion to create a more integrated ecosystem. Developing this logic further Kanda et al.,2025 introduces orchestrating as dynamic capabilities steering mature ecosystems towards circular economy resource sustainabilities hence making sustainability modernization-in-the-post-war-environment not extra objectives but structural characteristics within viable eco-systems.

Social and network mechanisms for recovery, bridging, and bonding forms of social capital add to the post-conflict dimension of entrepreneurship. Kopren and Westlund (2021) provide empirical evidence on the effects that different types of connections have on access to resources and innovation in unstable environments. In diaspora entrepreneurship, Syrett and Keles (2022) emphasize identity, opportunity, and resource elements leading to entrepreneurial practices; Williams (2019) provides evidence related to transformation change in diaspora policy within post-conflict economies-from narrow remittance based foci toward knowledge integration as well as transnational networks. Therefore this paper brings a broader understanding into what an ecosystem comprises not only economic but also social coordination space.

The peacebuilding perspective further deepens the ecosystem approach. Joseph et al. (2022) systematize the theoretical framework of the relationship between entrepreneurship and peacebuilding, showing the conditions under which economic activity can contribute to the restoration of social stability. Melin et al. (2025) analyze the entrepreneurship of former combatants at the micro level as a mechanism for individual integration and social readaptation. At the same time, Nkusi et al. (2020) demonstrate the role of an entrepreneurial university as the institutional core of the ecosystem in post-conflict Rwanda, which has direct parallels with the needs of human capital restoration in Ukraine. At the regional level, Flögel et al. (2025) argue that supporting ecosystems in lagging regions generates broader effects than the creation of startups, encompassing employment, skills development, and coordination of local actors, which is particularly relevant for territorially asymmetrical post-war recovery.

In summary, the current literature treats entrepreneurial ecosystems in a post-conflict environment as multidimensional systems where technological modernization, institutional quality, network interactions, and coordinated policies form the basis for long-term recovery. At the same time, empirical studies demonstrate the fragmentary nature of the results and the lack of integrated diagnostics of the actual state of ecosystems during the period of immediate military shock and the early stage of reconstruction. It is this analytical gap that necessitates a systematic study of the Ukrainian experience, combining the theoretical framework of post-war ecosystems with an empirical assessment of their current functionality. At the same time, most studies focus either on long-term post-war reconstruction or on institutional mechanisms of recovery, while the phase of immediate military shock remains less systematically analyzed. It is this transitional period, when the ecosystem functions in conditions of simultaneous destruction of the resource base, territorial asymmetry, and institutional instability, that forms a new configuration of interrelationships between its components.

Within this study, the functionality of the entrepreneurial ecosystem is operationalized through four interrelated structural dimensions: (1) the density of the entrepreneurial base, reflected in the number of small and medium-sized enterprises; (2) the ecosystem's ability to generate employment; (3) investment activity as an indicator of resource mobilization and financial confidence; (4) innovation dynamics as an indicator of modernization potential. The interrelationships between these components are interpreted as an empirical reflection of the degree of structural coherence of

the ecosystem. Changes in the strength and configuration of these relationships during the period of military shock are interpreted not only as a reduction in the scale of entrepreneurial activity, but also as a transformation of the very architecture of ecosystem interactions.

Materials and Methods

The study was conducted in 2023–2025 within the framework of an empirical-analytical design and was aimed at diagnosing the transformation of the functional capacity of Ukraine's entrepreneurial ecosystems in the context of economic recovery amid ongoing war and the formation of a post-war development trajectory. The empirical analysis covered statistical data for 2018–2024, which made it possible to compare the pre-war, war, and initial stages of structural economic changes and to assess the dynamics of indicators in different phases of systemic transformation.

The spatial boundaries of the study covered the territory of Ukraine with regional detail. The unit of analysis was aggregated regional indicators in the format of "region–year observations," which made it possible to compare the same territorial units over time. The comparison was made between the average regional values for the same territorial units in two periods, which justifies the use of methods for related samples. The regional level of analysis was chosen given the territorial nature of entrepreneurial ecosystems, which function as spatially rooted networks of interactions between businesses, institutions, and resource flows, as well as the intensification of spatial asymmetry in economic processes during wartime.

The analysis covered all regions of Ukraine with complete and comparable statistical data for 2018–2024. Regions with critical gaps in statistical reporting were excluded to ensure the accuracy of intertemporal comparisons.

The empirical basis of the study was formed on the basis of official statistical sets from the State Statistics Service of Ukraine, which contain regional socio-economic indicators for 2018–2024 (State Statistics Service of Ukraine, 2018–2024; Melnyk et al., 2022; Zayats et al., 2024). To ensure intertemporal and interregional comparisons, international databases were also used, in particular the World Bank's World Development Indicators (World Bank, 2024) and OECD regional statistics (OECD, 2024; Pavlovsky et al., 2024). International databases were used to contextualize macroeconomic dynamics and verify the comparability of indicators across countries (Atstaja et al., 2022; Shpak et al., 2024; Food and Agriculture Organization of the United Nations, 2021; 2023). All data were used in aggregate form without the use of personal information.

The entrepreneurial ecosystem was operationalized as a multidimensional system of interrelated quantitative variables without forming an integral index (Mironova et al., 2022; Gupta et al., 2024). The rejection of an integral index made it possible to preserve information about changes in the strength of intercomponent relationships, which is critical for analyzing the transformation of the ecosystem's systemic configuration. The analysis includes four key dimensions: structural (number of small and medium-sized enterprises at the regional level), socio-economic (level of employment in the entrepreneurial sector), resource (volume of capital investments), and innovation (indicators of innovation activity). Together, these dimensions form the functional configuration of the entrepreneurial ecosystem, where a change in one component affects the dynamics of others, allowing for the analysis of not only the levels of indicators but also the degree of their systemic coherence.

The method of analysis was descriptive statistics with the calculation of means, rates of change, and coefficients of variation. In testing for differences between the pre-war and war periods, Student's paired t-test or Wilcoxon related samples test in cases of non-normal distributions have been applied on aggregated mean values by region within each period. Normality has been tested by the Shapiro-Wilk test. Pearson or Spearman correlation analyses between main indicators of entrepreneurial ecosystems depending on the type of data shall be analyzed separately for pre-war and war periods to show changes in relationship structures with a statistical significance level at $p < 0.05$.

Data processing and analysis were performed using SPSS Statistics 27.0 software, as well as Microsoft Excel 365 for initial processing, visualization, and verification of the correctness of statistical calculations (Microsoft Corporation, n.d.), which ensures procedural transparency and the ability to reproduce results.

Results

Dynamics of key indicators of Ukraine's entrepreneurial ecosystems in the pre-war and war periods (2018–2024)

Descriptive statistical analysis was performed based on aggregated regional observations in the "region-year" format for 2018–2024, which made it possible to compare the average values and interregional variability of indicators in the pre-war (2018–2021) and wartime (2022–2024) periods. This approach makes it possible to interpret the changes obtained not only as fluctuations in individual indicators, but as a transformation of the functional configuration of the entrepreneurial ecosystem in the context of military shock (State Statistics Service of Ukraine, 2018–2024).

In the pre-war period, the average number of small and medium-sized enterprises (SMEs) per region remained relatively stable (47.8–49.6 thousand units), and the coefficient of variation did not exceed 0.21, indicating moderate interregional differentiation. After 2022, the average fell to 43,200, and in 2023–2024 it remained at 41,900–42,500. At the same time, the coefficient of variation increased to 0.29–0.31. This combination of a decrease in average values and an increase in variability means not only a reduction in the entrepreneurial base, but also an increase in the spatial fragmentation of the ecosystem. Some regions experienced a sharp decline in entrepreneurial activity, while others remained relatively stable, indicating the formation of asymmetric adaptation trajectories.

A very similar tendency took place in employment of the SME sector. In 2018–2021, on average, there were between 312 and 325 thousand persons employed per region. During the war year of 2022, this number dropped to 274 thousand and further declined or stabilized at 268–271 thousand in 2023–2024. The coefficient of variation increased from. A decline in employment means a weakening social function within an ecosystem along with diminishing multiplier effects. Growing regional differentiation signifies that not all local labor markets are equally impacted by wartime conditions; thus different starting points for post-war recovery are being created now already during wartime itself. In regions with a significant share of agricultural-and-processing businesses such changes may also impact stability within production-and-logistics chains related toward food supply.

The biggest changes happened in capital investment. Before the war, average regional investment volumes were between UAH 18.6 and 19.4 billion. In 2022 it decreased to UAH 10.2 billion, accompanied by an increase in the coefficient of variation from 0.37 to 0.58. There was partial recovery observed for years 2023-2024 but has not yet reached its pre-war level. This means that a narrowing happens within what can be considered as the ecosystem's resource subsystem while emphasizing more investments over fewer territories; thus explaining well with increasing coefficients on how polarized investing becomes eventually leading "centers" recoveries long stags region exist Innovation activity fairly stable during years twenty eighteen through twenty one (CV ≈. Innovation activity fell on average during the war. More importantly, interregional differentiation increased to attain its maximum in 2023. Some regions registered an increase in 2024 but remain, on a countrywide scale, below the pre-war levels.

The decline in innovation activity indicates a weakening of the technological component of the ecosystem and the risk of its functional conservation. Disruption of the coordination between the investment and innovation subsystems may complicate the implementation of green modernization and long-term structural transformation strategies.

Table 1.
Descriptive statistical characteristics of key indicators of Ukraine's entrepreneurial ecosystems in the pre-war and war periods (2018–2024).

Indicator	Pre-war period (2018–2021), M	War period (2022–2024), M	SD	CV
Number of SMEs, thousand units	48.9	42.5	9.8	0.31
Employment in SMEs, thousand persons	318.4	270.6	89.4	0.33
Capital investments, billion UAH	19.1	11.3	6.6	0.5
Innovative activity, %	15	11.8	3.7	0.3

Source: Compiled by the authors based on data from the State Statistics Service of Ukraine (2018–2024)
Note: M – mean value; SD – standard deviation; CV – coefficient of variation

A linear graph of indicator dynamics was used to visualize intertemporal changes in average regional values.

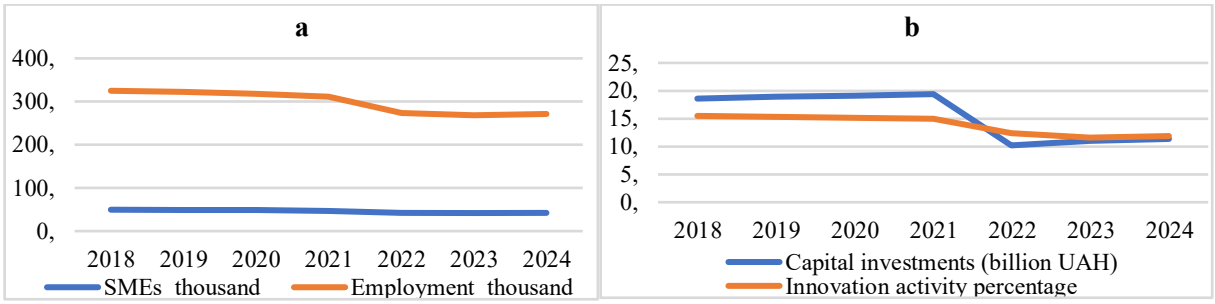

Figure 1. Dynamics of average regional values of key indicators of Ukraine's entrepreneurial ecosystems in the pre-war and war periods (2018–2024): (a) number of SMEs and employment in the entrepreneurial sector; (b) capital investment and innovation activity

Source: Compiled by the authors based on data from the State Statistics Service of Ukraine (2018–2024)

A graph of the dynamics of variation coefficients is used to reflect the increase in interregional differentiation.

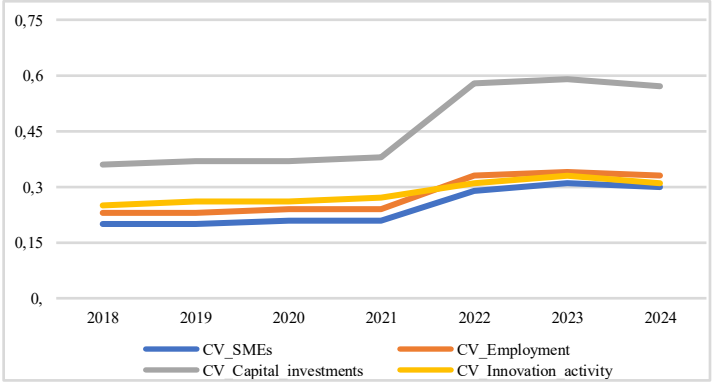

Figure 2. Dynamics of variation coefficients of key indicators of Ukraine's entrepreneurial ecosystems in 2018–2024

Source: Compiled by the authors based on data from the State Statistics Service of Ukraine (2018–2024), World Development Indicators (World Bank, 2024), and OECD Regional Statistics (OECD, 2024) using Microsoft Excel (Microsoft Corporation, n.d.)

To summarize the findings, there has been a systemic change in modifying the entrepreneurial ecosystem amid military shock. A reduction happens within the entrepreneurial base during wartime concurrently with declining employment and narrowing investment capacity together with weakening innovation activity, increasing interregional asymmetry upward steadfastly. This implies transformation concerning internal coherence of the ecosystem as well as post-war recovery uneven trajectory formation that must be further analyzed for statistically significant inter-period differences and spatial differentiation of transformations.

Statistically significant differences in the parameters of entrepreneurial ecosystems between the pre-war and war periods in the regions of Ukraine

For interperiod comparison of entrepreneurial ecosystem parameters, a procedure of pairwise comparison of regional averages was applied. For each region, average indicators were calculated for the pre-war (2018–2021) and war (2022–2024) periods, after which statistical testing of differences was performed. The normality of the distribution of differences was tested using the Shapiro–Wilk test, which determined the choice of parametric or nonparametric criteria. The level of statistical significance was set at $p < 0.05$.

An analysis of the number of small and medium-sized enterprises (SMEs) showed a statistically significant reduction in the indicator during the war period. The average regional value decreased from 48.9 thousand units in 2018–2021 to 43.8 thousand units in 2022–2024, which corresponds to a relative reduction of 10.4%. The distribution of differences corresponded to the conditions of normality, so Student's paired t-test was applied. The test results confirmed the statistical significance of the changes ($p < 0.05$).

A similar trend was observed in employment in the SME sector. The average level of employment decreased from 318,200 to 269,400 people per region, which means a reduction of 15.3%. Since the distribution of differences deviated from normal, the Wilcoxon test was used for interperiod comparison, which also showed a statistically significant difference ($p < 0.05$).

The most significant interperiod differences were recorded in the area of capital investment. The average volume of investment per region decreased from UAH 18.8 billion in the pre-war period to UAH 10.9 billion during the war, which corresponds to a decrease of 42.0%. The distribution of differences corresponded to parametric assumptions, so Student's paired t-test was applied, according to which the difference in mean values is statistically significant ($p < 0.01$).

The innovative activity of enterprises also showed a statistically confirmed decline. The average level of innovation activity decreased from 15.1% in the pre-war period to 11.7% during the war, which corresponds to a relative decrease of 22.5%. Given the abnormal distribution of differences, Wilcoxon's criterion was applied, which confirmed the statistical significance of the changes ($p < 0.05$).

Table 2.
Statistically significant interperiod differences
in key indicators of entrepreneurial ecosystems.

Indicator	2018–2021 (M)	2022–2024 (M)	Δ, %	Test	p-value
Number of SMEs, thousand	48.9	43.8	−10.4	T	< 0.05
Employment in SMEs, thousand persons	318.2	269.4	−15.3	W	< 0.05
Capital investments, billion UAH	18.8	10.9	−42.0	T	< 0.01
Innovative activity, %	15.1	11.7	−22.5	W	< 0.05

Source: Compiled by the authors based on data from the State Statistics Service of Ukraine (2018–2024), World Bank (2024), OECD (2024)

The results confirm statistically significant interperiod changes in all parameters of Ukraine's entrepreneurial ecosystems. The largest decline was recorded in the financial and investment subsystem, while the indicators of the number of SMEs, employment, and innovation activity show a less sharp but systematically consistent negative trend. Taken together, these changes reflect the structural transformation of regional entrepreneurial ecosystems under the influence of the war shock and form an empirical basis for further analysis of their adaptive potential in the context of post-war recovery.

Regional asymmetry in the transformation of entrepreneurial ecosystems under conditions of military shock

Given the use of the "region-year" data format and the recorded increase in variation coefficients in 2022–2024, the regional level of analysis is not an auxiliary but a structurally justified element of the study. The increase in interregional differentiation means that the military shock did not have a uniform impact, but transformed entrepreneurial ecosystems along different adaptation trajectories. To identify this asymmetry, regions were grouped according to the intensity of transformations based on the relative change in key indicators during the war period compared to the pre-war period.

The classification criterion was the aggregate dynamics of four parameters: the number of SMEs, employment in the SME sector, capital investment, and innovation activity. Based on the results of the comparative analysis, the regions were conditionally divided into three groups: regions of deep destabilization; regions of adaptive restructuring; regions of relative stability.

The group of deep destabilization recorded the largest relative losses in the entrepreneurial base and investment activity, accompanied by a sharp increase in variation coefficients. This group is characterized by a simultaneous reduction in the number of SMEs above the national average (–10.4%) and investments by more than 40%, which indicates the destruction of resource and entrepreneurial subsystems.

Regions undergoing adaptive restructuring showed a decline in basic indicators, but maintained relative functional consistency between the entrepreneurial, investment, and employment components. In these regions, the correlation between SMEs and employment remained strong, indicating the preservation of internal ecosystem logic even under conditions of reduced absolute scale of activity.

The relative stability group was characterized by the smallest decline in indicators and moderate growth in variability. These regions saw a faster stabilization of investment activity in 2023–2024, which may indicate the formation of potential "nuclei of recovery."

The quantitative characteristics of intergroup differences are presented in Table 5.

Table 5.
Typology of regions by intensity of transformation of entrepreneurial ecosystems (2018–2024).

Group of regions	Δ SMEs, %	Δ employment, %	Δ investment, %	Δ innovation activity, %	Nature of transformation
Deep destabilization	< –12	< –18	< –45	< –25	Destruction of resource and entrepreneurial subsystems
Adaptive restructuring	–8…–12	–12…–18	–35…–45	–15…–25	Partial reconfiguration of connections
Relative stability	> –8	> –12	> –35	> –15	Preservation of functional coherence

Source: Calculated by the authors based on data from the State Statistics Service of Ukraine (2018–2024)

Note: Group boundaries are defined based on average national values of changes in 2022–2024 compared to 2018–2021

From a post-war perspective, such asymmetry has a double effect. On the one hand, the concentration of investment in relatively stable regions can accelerate local modernization processes and the formation of network clusters. On the other hand, deepening spatial differentiation creates the risk of long-term structural imbalance and complicates balanced recovery.

Thus, the regional level of analysis is conceptually sound: it allows us to interpret the war shock as a factor not only in the overall decline in entrepreneurial activity, but also in the spatial reconfiguration of ecosystems. The identified asymmetry of transformation creates different starting positions for post-war development, which requires differentiated recovery strategies that take into account ecosystem integrity, innovation potential, and opportunities for green modernization.

Correlation relationships between indicators of entrepreneurial ecosystems at the regional level

In order to assess the degree of internal consistency of entrepreneurial ecosystems, a correlation analysis of key indicators in the "region-year" format for 2018-2024 was conducted. Within the ecosystem approach, correlation relationships are interpreted as an indicator of the functional integration of subsystems – entrepreneurial, socio-economic, investment, and innovation. A weakening of correlations in this context may indicate not only a change in individual parameters, but also a transformation of the structural architecture of the ecosystem.

In the pre-war years, high consistency was observed between the two indicators of SMEs and employment. A stable multiplicative mechanism worked in the ecosystem: entrepreneurial base expansion added more jobs. During war years this link weakened (Table 4) hence a direct association between enterprise activity and job creation to employ has been reduced meanwhile as an indication signal for breaking traditional logics/ways Regional economies create employments through enterprises have started catching up Moderately positive correlations found before war period among SME numbers & capital investment; employment & investment gradually weakened 2022–2024 This means a weakening in the resource support to the entrepreneurship subsystem and also that investment coordination at the regional level has declined. In other words, investments have become much less strictly connected to the scale of business activities in their flow under the context of war shock.

The weakest links were recorded between capital investment and innovation activity. Although the positive trend has been maintained, the decline in the correlation coefficient during the war period reflects a decrease in structural synchronization between the investment and innovation subsystems. This may indicate a reorientation of investments towards supporting basic stability rather than long-term modernization projects.

Table 4.
Correlations between key indicators of entrepreneurial ecosystems at the regional level.

Variable pair	2018–2021 (r)	2022–2024 (r)	Type of correlation	p-value
Number of SMEs – employment	0.78	0.64	Pearson	< 0.05
Number of SMEs – capital investments	0.52	0.37	Pearson	< 0.05
Employment – capital investments	0.59	0.41	Pearson	< 0.05
Capital investment – innovative activity	0.34	0.28	Spirman	< 0.05

Source: Compiled by the authors based on data from the State Statistics Service of Ukraine (2018–2024), World Bank (2024), OECD (2024)

Note: For each pair of variables in each period, the same type of correlation was applied, determined on the basis of the Shapiro–Wilk test

To sum up, the results of correlation analysis provide evidence of positive links between major components of entrepreneurial ecosystems, which have been preserved but systematically weakened in strength during the war period. This points to structural integration within ecosystems that is declining and partial disintegration between resource, entrepreneurial, and innovation subsystems. The transformation evolves with recovery potential in regional economies during a post-war phase as a constraint since ecosystem effectiveness substantially depends on not only individual indicator levels but also their coordinated interaction.

Discussion

According to the results of our empirical analysis at the regional level, in entrepreneurial ecosystems (see Table 4), during 2018–2021 some relatively stable positive correlations emerged between key indicators: number of SMEs; employment; volume of capital investment and innovation activity. The strongest correlation was found between SMEs and employment (r = 0.78). This means a structural alignment or real correspondence between the entrepreneurial base and labor market forces/variables/components/etc., whatever term best fits your conceptual framework (Sedita et al., 2025). There were moderate positive correlations both between SMEs and capital investment (r = 0.52) as well as employment & investment (r=0.59). At the same time however even though statistically significant, only weak links existed betwee!

In 2022–2024, all recorded relationships remained positive, but their strength decreased: for the pair "SMEs – employment," the coefficient decreased to r = 0.64; for "SMEs – capital investment," to r = 0.37; for "employment – capital investment" – to r = 0.41; for "capital investment – innovation activity" – to r = 0.28 ($p < 0.05$ in all cases). Thus, the updated results indicate not only a reduction in the absolute values of individual indicators in 2022–2023 (see Appendix A), but also a weakening of their statistical consistency. This indicates a change in the internal configuration of entrepreneurial ecosystems, where the interaction between quantitative parameters is less synchronous than in the pre-war period.

Theoretically, this finding is quite in line with the approach which considers that it is not a linear path of crisis-transformed entrepreneurship but rather through changes in institutional expectations, access to resources, and behavioral patterns by economic agents. Lee et al. (2023) show systematically that under long shocks, entrepreneurial activities turn into modes where adaptation becomes a priority; hence stabilizing and maintaining operational capacity become priorities over scaling up. The logic applies at the regional level: even if there has been relative stability in SME numbers for 2023–2024, weaker links with employment and investment demonstrate multipliers' weakening effects on entrepreneurial activity.

The weakening of correlations in 2022–2024 can be interpreted as an indicator of a decline in the "connectivity" of entrepreneurial ecosystems. Traditional transmission channels–from growth in the number of enterprises to expansion of employment and increased investment–are functioning less coherently. This dynamic allows us to view the war period as a phase of partial structural fragmentation of ecosystems. In this sense, the results are consistent with the findings of Guerrero et al. (2024), who showed that in times of shock, entrepreneurial expectations and investment behavior increasingly depend on the quality of the institutional environment and government support. Regional variability in indicators (see Appendix A) indirectly confirms the importance of environmental factors, although they were not directly included in the model.

This can also be explained from the point of view of interaction between actors in the entrepreneurial ecosystem. The statistical relationships found are weakened may be due to a possible weakening in both horizontal and vertical relationships among enterprises, financial institutions, and the labor market. Relational capacity defined as the ability or potentiality of firms to enter into

cooperation networks with other firms is considered by Gueguen et al. (2021) as a key condition for sustainability within any ecosystem; thus from their approach, our observed decline-in-correlation-coefficients result could quantitatively reflect war period network ties' weakness.

Network dimension is particularly important in the context of recovery. Liu et al. (2025) argue that post-shock recovery trajectories depend on the structural integrity of business networks, and that weak or broken links between their nodes slow down systemic recovery. Accordingly, the decline in correlations in 2022–2024 can be interpreted as a sign that even with the partial stabilization of individual indicators in 2024, the ecosystem is functioning in a state of heightened fragility.

Finally, the results are relevant to the discussion of long-term regional development. The weakening of the links between investment and innovation activity ($r = 0.34 \rightarrow r = 0.28$) indicates the risk of a recovery trajectory with limited modernization potential. This correlates with the approach of Sedita et al. (2025), who emphasize the need to combine economic, environmental, and social dimensions of regional development in post-crisis conditions. Thus, the updated results allow us to draw three analytical conclusions. First, the military shock manifests itself not only in the reduction of individual indicators, but also in the weakening of the structural coherence of ecosystems. Second, recovery should be seen as a process of rebuilding relationships between actors, rather than just quantitative growth in SMEs or employment. Third, the Ukrainian case corresponds to the general patterns of crisis entrepreneurship described in international studies, while demonstrating specific features related to the scale and duration of the military shock.

Food security assurance in the context of post-war entrepreneurial ecosystems

In the context of post-war economic recovery, the assurance of food security becomes an essential element of state economic regulation and regional resilience. Military challenges, destruction of infrastructure, disruption of logistics chains, and the growing socio-economic vulnerability of the population significantly increase the importance of stable food systems. For Ukraine, which simultaneously remains one of the world's major exporters of agri-food products while facing internal challenges related to the economic accessibility of food, the development of an effective model of food security assurance represents a strategic priority for post-war reconstruction.

Food security is increasingly understood as a multidimensional category that includes not only agricultural production but also the availability, accessibility, safety, and stability of food supply. In this sense, food security assurance requires coordinated institutional regulation, efficient resource allocation, and the development of sustainable supply chains capable of functioning under conditions of systemic uncertainty.

Within this framework, public–private partnerships become an important mechanism for mobilizing investment resources, modernizing agricultural infrastructure, and introducing technological innovations. Cooperation between the state and the private sector allows for more efficient use of limited resources, reduces risks, and supports the restoration of irrigation systems, storage facilities, logistics networks, and food processing capacities. In the post-war period, such partnership models can act as catalysts for structural modernization of the agri-food sector.

Another critical dimension is the digitalization of food security governance. The use of big data, geoinformation systems, sensor technologies, and artificial intelligence makes it possible to monitor crop conditions, forecast yields, assess environmental risks, and respond more quickly to crisis situations. Digital platforms also increase transparency in supply chains, reduce transaction costs, and minimize corruption risks. During the war, digital tools have already demonstrated their effectiveness in coordinating humanitarian aid and distributing food resources, thereby becoming an important institutional element of crisis management.

In addition, the assurance of food security requires an inclusive approach that ensures equitable access to resources such as land, financing, technologies, and information. Particular attention should be paid to small and medium-sized agricultural producers, who play a key role in maintaining local food stability and regional economic resilience. Expanding their access to financial instruments, insurance mechanisms, innovation technologies, and market infrastructure can significantly strengthen the resilience of the agri-food system.

At the same time, the implementation of a comprehensive food security assurance model faces a number of challenges, including infrastructure constraints, unequal access to digital technologies, limited investment resources, and insufficient integration of information systems. Additional risks are associated with climate change, environmental degradation, migration processes, and the continuing security threats caused by the war.

From the perspective of entrepreneurial ecosystem development, the agri-food sector may become one of the central nodes around which post-war economic recovery is organized. Agricultural production, logistics services, financial instruments, and digital solutions can form interconnected networks that support both regional economic development and national food security. In this context, state regulation should focus on creating favorable conditions for innovation, supporting agri-tech startups, promoting precision agriculture technologies, and developing risk-management instruments adapted to the specific challenges faced by Ukrainian producers.

Thus, food security assurance within the system of state economic regulation should be viewed as a multi-level framework that combines institutional mechanisms, digital technologies, inclusive policies, and partnership-based governance models. The effectiveness of such a system depends on the state's ability to balance market incentives with social guarantees and to integrate national development priorities with global economic processes. In the context of post-war reconstruction, this integrated approach can contribute to the sustainable development of the agri-food sector, strengthen economic resilience, and improve the overall quality of life of the population.

Conclusion

The study achieved its goal of identifying the nature and scale of the transformation of interrelationships between key components of entrepreneurial ecosystems at the regional level in 2018–2024. The analysis showed that in the pre-war period, relatively stable positive interdependencies were formed between the number of SMEs, employment, capital investments, and innovation activity. In 2022–2024, these relationships remained directional but weakened in strength, which is quantitatively expressed in a decrease in the correlation coefficients between all pairs of variables studied. Thus, the empirical results indicate not only a decrease in the absolute values of individual indicators during the crisis period, but also a transformation of the internal configuration of entrepreneurial ecosystems. A key consequence of the military shock was a decline in structural coherence between entrepreneurial activity, employment, and investment processes. This allows us to interpret the crisis as a phase of partial fragmentation of the ecosystem, when traditional channels of the multiplier effect function less synchronously.

The scientific novelty of the study lies in the quantitative recording of changes in systemic links between ecosystem components at the regional level, which complements existing approaches that focus primarily on the dynamics of individual indicators. The results show that assessing the sustainability of entrepreneurial ecosystems requires analysis not only of the scale of activities, but also of the degree of their internal coordination. The practical significance of the work lies in substantiating that post-crisis recovery policy should be aimed at reconstructing the connectivity of ecosystems – restoring investment and innovation channels of interaction, supporting the labor market, and strengthening network cooperation between actors. Only the restoration of structural coherence can ensure a systemic effect that goes beyond isolated support for individual sectors.

At the same time, the study has limitations related to the use of aggregated statistical data in the "region-year" format and the lack of micro-level and qualitative institutional indicators. This limited the possibilities for analyzing behavioral mechanisms and network interactions between business entities. Further research should focus on expanding the analytical framework by including indicators of the quality of the institutional environment, the intensity of network cooperation, and the innovative capacity of regions. It is also promising to combine quantitative and qualitative methods in order to study in greater depth the adaptive potential of entrepreneurial ecosystems and their trajectories of recovery in post-crisis conditions.

Appendix A
Raw regional annual data for correlation analysis of Ukraine's entrepreneurial ecosystem indicators (2018–2024).

REGION	YEAR	SMES_ THOUSAND	EMPLOYMENT _ THOUSAND	CAPITAL_ INVESTMENTS _ BLN_UAH	INNOVATION_ ACTIVITY_ PERCENT
Region_1	2018	48.25	366.81	24.123	15.18
Region_2	2018	46.56	284.74	18.979	15.05
Region_3	2018	55.28	285.31	22.931	16.1
Region_4	2018	53.75	342.45	18.732	15.78
Region_5	2018	54.95	347.73	19.779	16.57
Region_6	2018	42.52	221.21	15.69	13
Region_7	2018	33.96	196.24	11.222	10.64
Region_8	2018	37.23	251.94	18.006	14.6
Region_9	2018	42.73	297.12	19.533	14.64
Region_10	2018	51.98	374.31	20.107	13.17
Region_11	2018	50.99	337.56	22.795	13.15
Region_12	2018	43.56	253.93	10.278	12.93
Region_13	2018	53.23	318.6	23.505	18.2
Region_14	2018	53.02	355.08	23.141	13.04
Region_15	2018	52.64	363.12	14.936	14.24
Region_16	2018	46.14	332.22	17.447	14.41
Region_17	2018	51.59	300.5	20.07	15.15
Region_18	2018	52.77	323.47	22.656	17.43
Region_19	2018	47.38	340.02	23.503	20.33
Region_20	2018	36.17	278.52	17.516	14.64
Region_21	2018	40.13	316.49	13.811	14.74
Region_22	2018	58.86	310.84	18.034	11.67
Region_23	2018	49.7	378.33	27.042	13.16
Region_24	2018	44.14	320.36	23.345	17.32
Region_25	2018	42.64	292.87	17.042	14.11
Region_1	2019	42.76	297.64	18.276	14.71
Region_2	2019	47.52	263.76	15.105	16.79
Region_3	2019	48.03	260.32	20.743	17.03
Region_4	2019	64.17	405.57	21.395	11.87
Region_5	2019	57.13	463.29	21.834	13.58
Region_6	2019	53.3	310.88	17.787	13.81
Region_7	2019	49.61	367.51	20.622	17.3
Region_8	2019	44.52	299.86	10.518	9.2
Region_9	2019	55.02	333.32	21.582	16.88
Region_10	2019	58.34	405.4	25.784	16.31
Region_11	2019	43.23	253.64	14.044	11.28
Region_12	2019	44.35	287.65	17.84	14.06
Region_13	2019	34.11	232.66	15.074	16.79
Region_14	2019	53.41	324.92	17.178	18.88
Region_15	2019	53.64	416.31	29.225	15.77
Region_16	2019	51.4	352.75	21.908	16.91
Region_17	2019	49.66	327.97	14.183	13.05
Region_18	2019	42.77	288.96	15.585	15.53
Region_19	2019	54.65	364.48	21.775	15.77
Region_20	2019	45.14	290.89	15.739	15.02
Region_21	2019	48.25	338.58	15.143	15.69
Region_22	2019	42.89	253.36	15.009	12.86

Region_23	2019	50.64	303.22	14.662	11.78
Region_24	2019	58.25	373.82	17.678	14.22
Region_25	2019	35.64	310.44	12.353	14.16
Region_1	2020	53.52	292.42	19.143	17.37
Region_2	2020	52.12	348.58	23.01	16.41
Region_3	2020	51.06	324.06	20.868	13.39
Region_4	2020	54.62	332.47	16.162	14.8
Region_5	2020	60.96	427.52	22.03	16.83
Region_6	2020	44.71	282.86	16.911	9.32
Region_7	2020	50.05	280.72	14.899	10.56
Region_8	2020	37.82	222.71	17.029	18.73
Region_9	2020	47.42	346.51	18.375	10.34
Region_10	2020	49.4	339.15	18.056	15.26
Region_11	2020	52.95	306.94	13.781	12.88
Region_12	2020	47.52	302.4	21.276	19.68
Region_13	2020	45.29	327.16	21.693	17.42
Region_14	2020	57.12	357.62	23.356	20.63
Region_15	2020	55.22	335.38	21.861	18.58
Region_16	2020	51.61	310.29	23.285	13.51
Region_17	2020	52.33	340.31	16.035	16.67
Region_18	2020	51.71	289.05	19.632	14.33
Region_19	2020	34.48	209.79	14.339	15.66
Region_20	2020	49.78	325.13	20.379	14.89
Region_21	2020	57.52	376.26	22.44	16.9
Region_22	2020	41.1	247.75	20.281	16.58
Region_23	2020	46.15	316.02	16.765	14.96
Region_24	2020	43.25	298.65	12.531	16.13
Region_25	2020	45.21	234.67	14.476	13.2
Region_1	2021	50.87	296.16	19.716	23.49
Region_2	2021	38.58	271.67	15.04	14.52
Region_3	2021	35.31	195.01	14.41	14.23
Region_4	2021	61.8	374.7	22.695	22.3
Region_5	2021	43.07	249.4	15.47	14.19
Region_6	2021	54.76	357.65	18.13	14.93
Region_7	2021	67.47	473.31	16.903	13.04
Region_8	2021	41.85	306.66	17.264	18.94
Region_9	2021	55.19	389.63	22.3	15.49
Region_10	2021	50.52	377.41	22.521	14.97
Region_11	2021	57.96	376.45	21.117	13.47
Region_12	2021	44.16	266.89	7.542	14.02
Region_13	2021	53.16	337.11	23.032	17.09
Region_14	2021	52.51	245.2	15.582	15.46
Region_15	2021	59.94	451.9	28.766	14.61
Region_16	2021	31.67	242.79	14.581	16.33
Region_17	2021	47.25	317.39	13.683	14.36
Region_18	2021	45	309.34	19.374	4.92
Region_19	2021	51.13	332.96	21.799	16.89
Region_20	2021	44.88	273.47	22.167	16.01
Region_21	2021	55.63	370.39	19.15	13.01
Region_22	2021	49.17	326.98	20.711	12.61
Region_23	2021	43.88	280.26	21.562	10.7
Region_24	2021	52.07	315.09	20.053	14.19
Region_25	2021	50.68	390.83	22.552	16.68
Region_1	2022	46.95	279	11.766	7.01

Region_2	2022	45.92	189.61	12.389	12.52
Region_3	2022	48.52	326.41	12.66	11.01
Region_4	2022	39.79	322.49	10.306	11.43
Region_5	2022	36.99	222.15	9.771	11.8
Region_6	2022	40.62	245.47	9.522	11.46
Region_7	2022	30.67	206.1	12.958	10.33
Region_8	2022	41.8	380.4	10.322	8.91
Region_9	2022	36.83	306.73	15.755	10.33
Region_10	2022	47.54	276.67	10.577	7.54
Region_11	2022	50.68	265.5	12.095	11.74
Region_12	2022	57.78	390.45	10.527	11.35
Region_13	2022	51.47	251.16	10.514	11.67
Region_14	2022	31.17	168.21	6.067	11.07
Region_15	2022	37.39	289.91	11.219	13.07
Region_16	2022	41.57	289.29	11.252	9.82
Region_17	2022	49.78	336.04	16.883	12.53
Region_18	2022	41.3	198.45	2.56	7.18
Region_19	2022	48.52	267.53	5.797	11.82
Region_20	2022	38.11	231.53	9.719	11.03
Region_21	2022	47.06	206.92	10.413	10.01
Region_22	2022	50.6	257.4	14.742	13.2
Region_23	2022	55.02	292.79	13.551	12.61
Region_24	2022	30.9	196.91	9.202	9.24
Region_25	2022	37.11	182.51	9.069	11.6
Region_1	2023	35.99	161.78	12.168	10.6
Region_2	2023	43.04	265.66	9.873	12.62
Region_3	2023	39.34	245.71	8.058	7.76
Region_4	2023	38.23	348.21	11.649	16.21
Region_5	2023	46.26	306.18	10.412	11.6
Region_6	2023	56.77	383.03	11.573	11.08
Region_7	2023	52.66	280.22	13.823	10.07
Region_8	2023	46.17	351.56	13.756	12.97
Region_9	2023	43.46	277.2	10.972	14.02
Region_10	2023	52.44	330.21	9.579	10.44
Region_11	2023	45.7	293.41	8.511	12.61
Region_12	2023	63.48	319.85	12.36	14.89
Region_13	2023	39.02	237.26	10.943	12.66
Region_14	2023	40.08	311.17	7.249	12.63
Region_15	2023	45.1	271.11	12.084	11.85
Region_16	2023	53.34	284.81	11.959	8.8
Region_17	2023	34.7	219.26	7.22	9.18
Region_18	2023	31.79	203.85	10.131	13.27
Region_19	2023	26.16	192.69	11.27	14.42
Region_20	2023	54.53	263.49	10.441	12.33
Region_21	2023	49.56	312.94	12.364	12.42
Region_22	2023	35.59	238.1	12.331	11.15
Region_23	2023	52.98	201.86	9.991	14.23
Region_24	2023	48.8	350.61	12.694	9.84
Region_25	2023	39.16	318.33	7.734	9.53
Region_1	2024	29.13	188.8	8.81	12.29
Region_2	2024	34.67	302.87	12.544	11.33
Region_3	2024	34.77	180.59	9.866	15.11
Region_4	2024	41.57	213.26	10.583	10.21
Region_5	2024	35.81	164.22	9.493	13.93

Region_6	2024	51.65	355.99	12.689	13.15
Region_7	2024	50.35	296.68	12.43	11.04
Region_8	2024	51.28	270.61	12.839	13.47
Region_9	2024	49.26	327.12	11.113	10.7
Region_10	2024	40.18	240.42	8.508	10.22
Region_11	2024	37.51	195.76	11.199	9.84
Region_12	2024	42.62	329.47	15.273	12.76
Region_13	2024	48.64	312.83	16.572	16.02
Region_14	2024	51.66	307.69	11.297	12.81
Region_15	2024	41.91	242.48	12.631	9.26
Region_16	2024	27.7	158.41	7.074	10.55
Region_17	2024	36.96	251.97	6.177	13.86
Region_18	2024	45.65	252.09	11.58	14.06
Region_19	2024	48.73	297.14	12.824	13.76
Region_20	2024	33.66	172.76	8.442	12.87
Region_21	2024	53.07	325.03	15.14	14.43
Region_22	2024	42.65	237.64	9.506	11.37
Region_23	2024	54.53	354.34	9.941	9.17
Region_24	2024	49.6	317.13	9.767	12.93
Region_25	2024	52.98	361.6	12.429	14.89

Sources: Data is presented in a "region-year" format and is based on official statistical sources. The values are used for correlation analysis without processing personal data. Regional codes are used for the purpose of standardization and comparability of indicators

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