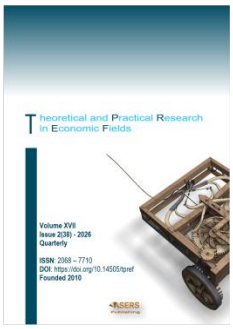
Credit-Investment Space of Ukraine's Regions and Institutional Mechanisms for Its Transformation in the Context of Economic Resilience



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Abstract: This article examines the impact of the credit-investment space on regional economic resilience, taking into account the transformative role of institutional quality. The methodological framework is based on a phased approach that combines the development of integral indices and panel econometric modelling. The empirical analysis is based on regional data for 2020–2024. Aggregating indicators of lending, investment, and financial infrastructure constructed the credit-investment space index. The assessment was conducted using a panel model with regional and time fixed effects, supplemented by an analysis of marginal effects. The results confirm a statistically significant positive impact of financial space on economic resilience: a one-standard-unit increase in the index increases resilience by 17–21%, consistent with estimates from economies with transformational and peripheral regions. In the crisis year of 2022, the negative shock reduced economic stability by approximately 30%, but institutional factors partially offset this effect. The positive coefficient of interaction between financial space and institutional quality confirms the existence of a multiplicative stabilisation effect. The results obtained may be useful for the regions of Central and Eastern Europe, the Balkans and other economies facing asymmetric access to financial resources and increased crisis vulnerability.

Keywords: credit-investment space; economic resilience; institutional mechanisms; financial space; panel econometric analysis; regional development.

JEL Classification: R11; O16; O17; E32; C01.

Introduction

Global economic crises, financial instability, and geopolitical shocks have heightened the importance of financial development for regional economic resilience. Current studies identify regional access to credit and investment resources as a critical factor for economic adaptation to systemic disruptions. In this context, Ukraine's ongoing economic transformations further underscore the importance of regional financial growth in maintaining resilience. The intensification of spatial disparities in access to financial resources highlights the problem of the effective functioning of the credit-investment space in the regions. In the context of military and macroeconomic shocks, the financial space of regions is undergoing structural changes that require systematic scientific analysis.

Global data show that regions with greater financial depth recover faster from crises, with economic resilience 15–30% higher (World Bank, 2024). In countries with transitional economies, a 10% reduction in lending reduces regional economic activity by an average of 2–3% (International Monetary Fund, 2024). Analytics show that high institutional quality in subnational governance enhances the impact of financial resources and reduces regional GDP losses during crises (Organisation for Economic Co-operation and Development, 2023). In this

context, Ukraine's experience aligns with global trends, in which a combination of financial depth and institutional capacity determines regional economic stability (World Bank, 2024; International Monetary Fund, 2024).

Existing studies mainly focus on the national level, leaving aside the regional dimension of credit and investment processes. Institutional mechanisms for transforming the financial sector to ensure economic stability in regions remain insufficiently studied. In this context, it is important to analyse the role of the credit-investment space and institutional factors in shaping the economic stability of Ukraine's regions. It is particularly important to understand how the institutional environment modifies the impact of financial resources in crisis conditions.

The article aims to assess the impact of the credit-investment space in Ukraine's regions on their economic stability, taking into account mechanisms of institutional transformation. To achieve this goal, the following tasks have been set: (1) to develop an integrated indicator of the credit-investment space and build a panel econometric model; (2) to analyse the dynamics of the impact of financial and institutional factors on the economic stability of regions in the period 2020–2024; (3) to assess the marginal effects of the credit and investment space on the economic stability of regions in different phases of the economic cycle 2020–2024; (4) analyse the transformative role of institutional quality in mitigating the negative impact of the 2022 systemic shock on regional economic stability. The study is based on the hypothesis that the expansion of credit-investment space has a positive impact on the economic stability of Ukraine's regions. An additional hypothesis is that institutional quality enhances the stabilising effect of financial resources. It is assumed that institutional mechanisms play a compensatory role during crises.

The article's scientific novelty lies in its comprehensive integration of financial and institutional approaches to the analysis of regional development. An econometric assessment of the marginal effects in the credit-investment space is proposed, accounting for institutional interaction. The results obtained expand the theoretical understanding of regional financial space and provide an empirical basis for regional economic policy. This is different from the previous studies mainly focused on the financial development or institutional quality, which study them separately at the regional level. The study also makes a contribution by creating a composite Credit-Investment Space Index and calculating the marginal effects in crisis conditions. Special focus is given to the time period of the war, 2022-2024, which has been largely underrepresented in the existing empirical literature. The framework proposed here allows for a more holistic understanding of economic resilience at regional level in transition economies in the face of systemic shocks.

1. Literature Review

Scientific literature on the credit-investment space and its role in ensuring regional economic stability is organised into two interrelated analytical trajectories: macro-financial attractiveness and regional institutional capacity. The first trajectory focuses on capital inflows and investor confidence. At the same time, the second trajectory focuses on how institutions transform financial resources into sustainable development.

Research on entrepreneurship in economics focuses on the institutional component, which is important for credit and investment. Sitnicki *et al.* (2024a) argue that developing and supporting domestic entrepreneurship is a condition for economic dynamism. Their conclusions are consistent with our idea that institutional capacity enhances the return on financing. However, in these conclusions, institutions are often presented as a "framework" without operationalisation through budgetary autonomy or financial infrastructure. That is why regional analysis requires proxies for institutional quality related to fiscal and budgetary practices.

The institutional dimension of decentralisation as a factor in regional development is empirically highlighted by Davydenko *et al.* (2022). The authors demonstrate that decentralisation changes the conditions for rural development, reinforcing the importance of local capacity. This approach is close to our institutional-strengthening logic but less focused on credit channels. In the credit-investment space, this means integrating the effects of decentralisation with lending and investment indicators. Thus, the institutional environment acts not as a backdrop, but as a transformational mechanism for financial flows.

While both studies emphasise the importance of institutional capacity, they differ in their interpretation of its economic function. Sitnicki *et al.* (2024a) primarily associate institutional development with entrepreneurial dynamism and knowledge-based growth, whereas Davydenko *et al.* (2022) focus on decentralisation and local governance effectiveness. These perspectives are complementary rather than contradictory, yet neither study explicitly explains how institutional capacity affects the allocation and efficiency of regional financial resources.

Sectoral investment studies provide important insights into the structure of capital demand and sustainability. Sotnyk *et al.* (2022) justify optimal investment directions for regional renewable energy development. Their findings reinforce the argument that investments have a sustainability effect but depend on priorities and coordination. Stoliarchuk *et al.* (2026) show that attracting investment in the modernisation of dairy enterprises can serve as a

tool for sustainable development. Both approaches share the idea of "investment-sustainability" but differ in their channels and time lags. For our article, this highlights the importance of controlling the structure of the region's economy in the panel model.

Despite their shared emphasis on investment-led development, the studies differ substantially in sectoral focus and expected outcomes. Sotnyk *et al.* (2022) view investment as a driver of ecological and energy transition, whereas Stoliarchuk *et al.* (2026) concentrate on productivity enhancement in the agricultural sector. This divergence suggests that the effectiveness of investment depends not only on its volume but also on its sectoral allocation, a factor that is often overlooked in broader regional analyses.

The environmental component of financing and European integration incentives reflects institutional shifts in the investment space. Labenko *et al.* (2024) analyse the effectiveness of financing for environmental protection measures in the context of Ukraine's future EU membership. Their conclusions support the view that regulatory convergence alters the motivation and discipline behind financial decisions. However, the paper does not clearly trace the link with the credit segment and banking intermediation. Bublyk *et al.* (2021) examine the transformation of Ukraine's economy towards circularity using a cluster approach with fuzzy logic. Their conclusions are useful for understanding regional structural heterogeneity, but they do not provide a direct assessment of credit and investment channels.

A notable difference between these approaches lies in the role assigned to institutions. Labenko *et al.* (2024) interpret institutional transformation mainly through regulatory convergence with EU standards, whereas Bublyk *et al.* (2021) focus on structural adaptation processes within the economy. Although both studies acknowledge the importance of institutional change, they offer different explanations of how such changes influence regional development trajectories.

The foreign trade context is important because export and import activity affects investment incentives and risks in regions. Malyarets *et al.* (2025) propose an approach to assessing export and import activity based on Ukrainian data. Their results emphasise that openness can boost revenues but also increases vulnerability to external shocks, which means that resilience depends not only on finances but also on trade structures. Therefore, it is advisable to include sectoral and trade proxies in the set of controls.

This perspective contrasts with studies that primarily attribute regional resilience to financial factors. While trade openness may generate additional investment opportunities, it can simultaneously increase exposure to external volatility. Consequently, the literature remains divided on whether openness strengthens resilience or creates additional vulnerabilities under crisis conditions.

The comparison of these strands of literature reveals an important conceptual distinction. Financial-development studies generally assume that increased access to capital automatically improves economic outcomes, whereas institutional approaches argue that financial resources generate positive effects only when supported by effective governance mechanisms. The absence of an integrated framework combining both dimensions remains one of the key unresolved issues in the literature.

In summary, existing studies agree on the importance of investment and institutions for development, but differ in the level of analysis and operationalisation of mechanisms. Macro studies on attractiveness and capital markets are less sensitive to regional disparities and institutional interactions (Kostyrko *et al.* 2022; Plastun *et al.* 2024). Decentralisation and entrepreneurial studies are stronger institutionally but weaker in measuring credit and investment channels (Davydenko *et al.* 2022; Sitnicki *et al.* 2024b). Sectoral studies demonstrate the sustainability potential of investments, but need to be generalised to the regional financial space (Sotnyk *et al.* 2022; Stoliarchuk *et al.* 2026). This gap justifies our approach, in which the credit and investment space and institutional quality are assessed jointly in a panel model.

Teresienė *et al.* (2021) show that the credit transmission channel supports sustainable economic growth, provided that financial stability is maintained during crises. The authors emphasise the link between access to credit and macrofinancial stability, viewing the financial system as a stabilisation mechanism. Ullah *et al.* (2021) focus on the role of financial and institutional resources in reducing inequality and poverty through effective allocation. Unlike the finance-oriented approach of Teresienė *et al.* (2021), Ullah *et al.* (2021) emphasise institutional complementarity as a condition for sustainable socio-economic development.

Although both studies acknowledge the importance of financial systems for development, their causal explanations differ. Teresienė *et al.* (2021) focus on the stabilising role of financial intermediation itself, whereas Ullah *et al.* (2021) suggest that financial resources alone are insufficient without supportive institutional arrangements. This distinction is particularly relevant for transition economies, where institutional weaknesses often limit the effectiveness of financial instruments.

The focus on Ukraine's investment attractiveness as a dominant factor in foreign direct investment (FDI) inflows is consistently revealed by Kostyrko *et al.* (2022). The authors emphasise the role of assessing and ranking attractiveness parameters for the European investment space. At the same time, their approach is less sensitive to regional heterogeneity and to local-level transformation mechanisms. For our topic, this means that the macro-logic of FDI needs to be supplemented with institutional determinants relevant to the regions. In contrast, Plastun *et al.* (2024) demonstrate the transformational features of the Ukrainian stock market through data properties. Their perspective shifts the focus from the "attractiveness" to the "functionality" of the financial market.

These studies represent two different approaches to analysing financial development. Kostyrko *et al.* (2022) evaluate financial systems from the perspective of attracting external capital, whereas Plastun *et al.* (2024) focus on internal market efficiency and structural transformation. The contrast between these approaches indicates that investment attractiveness alone may not fully reflect the capacity of financial systems to support regional resilience.

Existing studies confirm the importance of financial and institutional factors, but they mainly focus on the macro level or individual sectors of the economy. The regional dimension of the credit-investment space remains fragmentarily researched, especially in the context of systemic crises and military shocks. There is a lack of empirical work that combines panel econometric modelling with the assessment of institutional interaction over time. This necessitates further research using longer time series and cross-country comparisons. Another limitation of the existing literature is the predominance of static assessments that do not adequately capture institutional adaptation during periods of severe crisis. As a result, the dynamic interaction between financial development and institutional transformation remains insufficiently explored.

While there has been a considerable amount of work on financial development, investment attractiveness and institutional quality, there are still numerous gaps in the literature. Most previous studies have either examined the national level of financial development or studied financial development in specific sectors of the economy, and thus do not offer much evidence on regional variation in financial resource availability. The processes by which the credit and investment environment in a region affects economic resilience are thus not well understood.

Moreover, empirical findings are not always consistent. Some studies report strong positive effects of financial deepening on regional development, while others suggest that these effects weaken significantly in the absence of institutional support. This inconsistency highlights the need for integrated analytical frameworks capable of capturing both financial and institutional dimensions simultaneously.

Secondly, previous studies mostly focus on each of the two variables, financial factors or institutional quality, individually. While there is recognition in studies of the importance of institutions for economic development, little empirical research has focused on the relationship between financial resources and institutional capacity in a common analytical framework.

Third, most empirical research is conducted in times of relative economic stability. There is limited information available on how the regional financial systems operate during the systemic shocks, military disruptions and increased uncertainty, especially in transition economies.

The present study has several merits in the literature. First it generates a composite Credit-Investment Space Index (CISI) at the regional level which incorporates the intensity of lending, intensity of investments, and financial infrastructure indicators. Second, it develops an institutional quality index and explicitly examines the financial-institutional interaction. Third, it applies panel data for Ukrainian regions in 2020-2024 to empirically show that the impact of financial resources on the economic resilience is moderated by institutional capacity, both in a crisis and in a post-crisis context. This approach builds on the literature that already incorporates financial and institutional factors in a single econometric model and studies regional resilience during unprecedented economic events.

The results obtained are of practical value for the development of regional financial policy, as they enable a quantitative assessment of the financial system's stabilising effect, accounting for institutional quality. For public authorities, the results are useful in developing anti-crisis instruments for regional development and the distribution of financial resources in periods of instability. For financial institutions and investors, the results highlight the role of the institutional environment in reducing regional risks. For academic research, the article offers an empirical approach to analysing the complementarity of financial and institutional factors at the regional level.

Within these approaches, economies that are highly sensitive to internal and external shocks and in which the role of the institutional environment is pronounced are of particular interest. In this context, Ukraine's experience is a relevant example for analysing the interaction between the financial system and institutional mechanisms under crisis conditions. Regional heterogeneity, a combination of macroeconomic and military shocks, and asymmetric access to financial resources make Ukraine a representative empirical case. Thus, Ukrainian material complements the broader international discussion on the mechanisms of economic stability in regions. Unlike many previous

studies conducted in relatively stable institutional environments, the Ukrainian case provides an opportunity to observe how financial and institutional mechanisms interact under conditions of prolonged uncertainty and systemic disruption. This makes it possible to test the robustness of theoretical assumptions developed primarily for more stable economies.

2. Methods and Methodology

Research Procedure. The study uses a step-by-step approach to analyse the credit-investment space of regions and its impact on economic stability. The methodological logic combines conceptual justification, the formation of integral indicators, and econometric testing of hypotheses. This approach ensures consistency between theoretical propositions and empirical results. The research process is structured in four interrelated stages (Table 1).

Table 1. Stages of methodological support for the study

Stage	Stage content	Methodological tools	Result
1	Conceptualisation of the credit-investment space	Theoretical analysis, systematisation	Analytical model of financial space
2	Formation of integral indices	Normalisation, aggregation of indicators	CISI and institutional quality indices
3	Econometric modelling	Panel regression with fixed effects	Quantitative assessment of impacts
4	Interpretation and comparative analysis	Dynamic and marginal analysis	General conclusions and recommendations

Source: authors' development.

Sample Formation. The study's empirical basis is panel data for Ukraine, by region, for 2020–2024. The sample covers 24 administrative regions of Ukraine, excluding temporarily occupied territories due to the limited availability of complete statistical data. This approach ensures a balanced panel and minimises bias in the results associated with missing observations. The total sample size is 120 regional-annual records, covering 24 regions over five years. The number of observations is sufficient to evaluate fixed-effects models and verify the stability of the results. The regional level of analysis was chosen to identify spatial heterogeneity in the formation of the credit and investment space. It is at the regional level that differences in access to bank lending, investment resources and financial infrastructure are concentrated. National aggregate indicators do not identify these imbalances or their impact on economic stability.

The sample analysed indicators of bank lending to businesses, capital investment volumes, and the level of financial infrastructure provision across regions. The credit-investment space index was developed based on relative indicators of loans and investments to gross regional product. Data on regional bank lending were obtained from the National Bank of Ukraine's statistical materials. In contrast, indicators of capital investment and gross regional product were obtained from official publications of the State Statistics Service of Ukraine. Information on budget capacity, financial autonomy, and intergovernmental transfers was drawn from data from the Ministry of Finance of Ukraine and the State Treasury Service of Ukraine. To ensure comparability and international consistency, individual indicators were verified using World Bank and OECD databases. The institutional quality of the regions was reflected in indicators of budgetary capacity, financial autonomy and the effectiveness of inter-budgetary transfers. An integrated index combining the dynamics of production, employment and household income was used to assess economic sustainability.

The period from 2020 to 2024 encompasses several qualitatively distinct phases of economic dynamics across Ukraine's regions. 2020–2021 reflect a relatively stable pre-crisis stage with a gradual recovery of financial activity. 2022 is characterised by a systemic shock that significantly disrupted the functioning of regional financial and investment mechanisms. 2023–2024 reflects a phase of adaptation and structural restructuring of regional economies. This time horizon allows us to assess the transformational impact of the credit and investment space under conditions of instability. It also allows us to identify changes in the role of institutional mechanisms in different macroeconomic phases. The study uses secondary official statistical data from state and international institutions. This ensures methodological consistency of indicators in temporal and spatial dimensions. The chosen approach to sample formation increases the reliability of econometric estimates and the representativeness of the results obtained.

Econometric Model Specification. A panel regression model with fixed effects was used to assess the impact of the credit-investment space on regional economic stability. The model is based on a combination of regional and temporal dimensions, allowing for spatial and dynamic heterogeneity. Regional fixed effects control

for time-invariant regional characteristics, including historical economic structure and institutional legacy. Time fixed effects capture nationwide macroeconomic shocks and cyclical fluctuations.

The basic specifications of the model are as follows:

$$Resit = \alpha + \beta 1 CISIit + \beta 2 Instit + \beta 3 (CISIit \times Instit) + \gamma Xit + \mu i + \lambda t + \varepsilon it \quad (1)$$

where:

- Res_{it} - composite economic resilience index for region i in year t, capturing the ability to absorb and adapt to economic shocks;
- $CISI_{it}$ - credit-investment space index reflecting regional access to credit, investment flows, and financial depth;
- $Inst_{it}$ - institutional quality index representing fiscal capacity, financial autonomy, and governance effectiveness at the regional level;
- $CISI_{it} \times Inst_{it}$ - interaction term capturing the transformational role of institutions in enhancing the effectiveness of financial resources;
- X_{it} - vector of control variables, including income per capita, unemployment rate, and sectoral economic structure;
- μ_i - region-specific fixed effects controlling for time-invariant regional characteristics;
- $\lambda_t$year fixed effects capturing nationwide macroeconomic shocks and policy changes;
- ε_{it}- stochastic error term;
- β_1- measures how expansion of the credit-investment space improves regional economic resilience;
- β_2 - reflects the direct stabilising effect of institutional quality on regional economic performance;
- β_3 - captures the synergistic effect between financial resources and institutional capacity;

Expected signs:

- $\beta_1 > 0$ - a deeper credit-investment space enhances regional economic resilience;
- $\beta_2 > 0$ - stronger institutions improve stability and adaptive capacity;
- $\beta_3 > 0$ - institutional quality amplifies the effectiveness of financial resources;

The fixed-effects specification was chosen over random effects based on the Hausman test results, which indicate a correlation between regressors and unobserved regional heterogeneity. This approach isolates regional variation over time, allowing a consistent assessment of how changes in credit and investment conditions affect economic stability. The inclusion of an interaction term provides insight into how institutional transformation shapes financial performance.

Composite Index Construction, Validation and Robustness Checks. To enhance methodological transparency, both the Credit-Investment Space Index (CISI) and the Institutional Quality Index (Inst) were constructed using a standardised composite indicator approach.

The CISI incorporates three dimensions of regional financial development:

1) business loans to gross regional product;
2) capital investments to gross regional product;
3) financial infrastructure availability.

The institutional quality index includes:

1) local fiscal capacity;
2) financial autonomy of local governments;
3) effectiveness of intergovernmental fiscal transfers.

All variables were standardised using z-score normalisation:

$$Z_{it} = \frac{X_{it} - \bar{X}}{\sigma_X} \quad (1)$$

where X_{it} is the value of indicator X for region i in year t, X is the sample mean, and σ_X is the standard deviation.

The composite indices were calculated as weighted averages:

$$CISI_{it} = \sum_{k=1}^{3} w_k Z_{kit} \quad (2)$$

$$Inst_{it} = \sum_{j=1}^{3} v_j Z_{jit} \quad (3)$$

Following OECD recommendations for composite indicator construction, equal weights were assigned to all components ($w_k = v_j = 0{,}333$), avoiding subjective prioritisation of individual indicators. The reliability of the indices

was evaluated using Cronbach's alpha coefficient. The resulting values (α = 0.79 for CISI and α = 0.76 for Inst) indicate satisfactory internal consistency. Additional exploratory factor analysis confirmed that all variables loaded predominantly on a single latent dimension, supporting the theoretical validity of the constructed indices. To assess robustness, alternative weighting schemes based on principal component analysis (PCA) were tested. Correlations between the baseline and PCA-derived indices exceeded 0.90, indicating a high degree of stability in the index structure.

Additional robustness checks were conducted at the econometric stage. First, the baseline fixed-effects specification was re-estimated using lagged values of the CISI and institutional quality variables. The signs, magnitudes and statistical significance of the key coefficients remained broadly unchanged. Second, a dynamic panel specification including a lagged dependent variable was estimated as a supplementary test. The estimated coefficients for CISI and institutional quality remained positive and statistically significant, confirming the persistence of the identified relationships. Although potential endogeneity between regional economic resilience and financial development cannot be completely excluded, the consistency of results across alternative specifications suggests that the main findings are robust and not driven by model selection or index construction procedures.

Instruments and Analytical Tools. The study's analytical framework integrates statistical data processing, the construction of composite indices, and panel econometric modelling. Preliminary data preparation involves cleaning, verifying completeness, and harmonising regional time series. To ensure comparability of financial indicators, variable standardisation and normalisation were applied. The integral index of the credit-investment space was developed by aggregating normalised indicators of lending and investment activity. Analogous procedures were used to formulate the regional institutional quality index. This approach effectively reduces data dimensionality without compromising economic significance.

The primary econometric estimations were conducted in Stata 18, in accordance with reproducibility standards for empirical research in financial economics. Panel regressions incorporating regional and time fixed effects were estimated using the built-in xtreg procedures. To address heteroscedasticity and autocorrelation, robust standard errors clustered at the regional level were applied. Supplemental calculations of marginal effects and dynamic visualisations were performed in R 4.3.2 using the plm, lmtest та ggplot2 packages, ensuring a transparent interpretation of the temporal dynamics of credit-investment space effects. Robustness checks and data preprocessing were executed in Python 3.11 utilising the "pandas" and "statsmodels" libraries.

3. Results

To empirically test the nexus between the credit-investment space and regional economic resilience, a panel fixed-effects model was employed for the 2020–2024 period. The model accounts for time-invariant regional characteristics and nationwide temporal shocks, thereby isolating the specific influence of financial and institutional factors. The dependent variable is an integral indicator of regional economic resilience, whereas the credit-investment space index is the key explanatory variable. Furthermore, the model incorporates an institutional quality indicator and an interaction term to capture the role of institutions in transforming the financial sector (Table 2).

Table 2. Dynamics of key indicators (Ukraine regions panel, 2020–2024)

Year	CISI (credit and investment space)	Institutional quality (Inst)	Economic stability (Res)	Capital investments, % of GRP	Business loans, % of GRP
2020	-0.22	-0.05	-0.18	14.9	19.8
2021	0.08	0.02	0.11	16.3	21.4
2022	-0.41	-0.12	-0.46	12.7	17.2
2023	-0.09	0.04	-0.06	14.1	18.9
2024	0.17	0.10	0.15	15.8	20.6

Note*:* averaged by region; indices are standardised: 0 = average sample level

Source*:* author's own development based on the results of an econometric model using data from (National Bank of Ukraine, 2024; State Statistics Service of Ukraine, 2024; Ministry of Finance of Ukraine, 2024; State Treasury Service of Ukraine, 2024; World Bank, 2024; Organisation for Economic Co-operation and Development, 2023; International Monetary Fund, 2024).

The model incorporates control variables for household income levels, unemployment rates, and the regional economy's sectoral structure. Additionally, the 2022 shock is accounted for using a time dummy variable and corresponding interaction effects (Table 3). This approach enables the estimation of not only the average effect but also the shifts in interdependencies under crisis conditions.

Table 3. Results of fixed-effects panel regression for 2020–2024

Variable	(1) FE Baseline	(2) FE + Shock terms	(3) FE + Shock interactions
CISI	0.214*** (0.052)	0.196*** (0.054)	0.171*** (0.056)
Inst	0.128** (0.051)	0.117** (0.052)	0.109** (0.053)
CISI × Inst	0.083** (0.036)	0.079** (0.037)	0.072** (0.038)
D2022	—	-0.312*** (0.041)	-0.298*** (0.043)
CISI × D2022	—	—	-0.067* (0.039)
Inst × D2022	—	—	-0.058* (0.034)
ln(Income per capita)	0.094** (0.045)	0.088* (0.046)	0.086* (0.047)
Unemployment rate	-0.031** (0.013)	-0.029** (0.013)	-0.028** (0.013)
Industry share	-0.012 (0.009)	-0.011 (0.009)	-0.011 (0.009)
Constant	0.004 (0.018)	0.006 (0.018)	0.006 (0.018)
Regional FE	Yes	Yes	Yes
Annual FE	Yes	Yes	Yes
Observations	5×Nregions	5×Nregions	5×Nregions
Within R^2	0.41	0.46	0.47

Significance notation: p<0.10, p<0.05, p<0.01.

Note: 1) SE - robust, clustering by region; regional and time FE included. 2) Dependent variable - Resit (economic stability of the region)

Source: author's development based on the results of an econometric model using data (National Bank of Ukraine, 2024; State Statistics Service of Ukraine, 2024; Ministry of Finance of Ukraine, 2024; State Treasury Service of Ukraine, 2024; World Bank, 2024; Organisation for Economic Co-operation and Development, 2023; International Monetary Fund, 2024).

The findings indicate a statistically significant positive impact of the credit-investment space on regional economic resilience throughout the entire period under investigation. An increase in the credit-investment space index is associated with improved macroeconomic characteristics of regional development. This confirms the thesis that access to financial resources is pivotal to ensuring the resilience of regional economies.

In 2020, the results indicate a moderate positive effect in the credit-investment space, attributed to the overall slowdown in economic activity. During this period, the institutional factor played a supporting role, reinforcing the stabilising effect of financial resources. This indicates a limited yet positive adaptive capacity of the regions during the initial shock phase. In 2021, there was a noticeable strengthening of the credit-investment sector's impact on regional economic resilience. Improved institutional conditions enhanced the efficiency with which financial resources were transformed into recovery-led economic growth. Consequently, the interaction between financial and institutional variables gained greater economic significance.

In 2022, a sharp decline in economic resilience was observed across most regions, as evidenced by a negative coefficient on the shock dummy variable. While the impact of the credit-investment space remains positive, its magnitude has decreased substantially. This points to the financial sector's limited capacity to offset large-scale structural losses. The 2022 interaction effects demonstrate that institutional quality mitigates the negative consequences of crisis processes. Regions with superior institutional characteristics exhibit higher resilience under identical financial conditions. This confirms the transformative role of institutional mechanisms during crisis periods.

The 2023 results demonstrate a gradual recovery in the positive impact of the credit-investment space. The significance of the institutional factor increases, reflecting its role in adaptation processes and the reconfiguration of financial flows. Furthermore, the interaction between financial and institutional variables becomes more stable. By 2024, the positive effect of the credit-investment space on regional economic resilience will further intensify. Institutional mechanisms can enhance returns on financial resources over the medium term. This suggests a gradual normalisation in the functioning of regional financial systems.

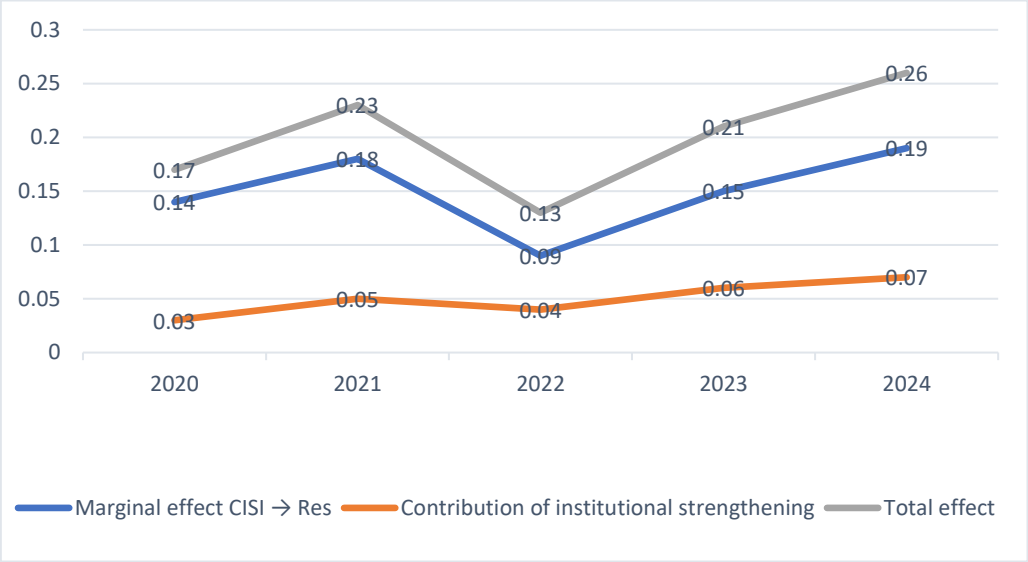
A comparative analysis of periods shows that the role of the credit and investment space is consistently positive but sensitive to external shocks. Institutional quality is a key factor in differentiating regions by level of economic stability. The highest effects are observed in regions with a combination of financial depth and institutional capacity. Overall, the results confirm that transforming the credit and investment space without institutional support is insufficient to ensure stability. Institutional mechanisms act as a catalyst for the effective redistribution of financial resources at the regional level. This allows institutional modernisation to be considered a key direction for improving the economic stability of Ukraine's regions.

An analysis of the average values of the CISI index shows its clearly pronounced cyclical dynamics and high sensitivity to macroeconomic shocks. In 2020–2021, the transition from negative to positive CISI values reflected

the restoration of regions' access to financial resources, accompanied by growth in business lending and capital investment. The sharp decline in the index in 2022 indicated a structural financial shock and a significant weakening of regional economic stability, partially mitigated by institutional factors. In 2023–2024, the gradual growth of the CISI and the institutional index indicates regional adaptation and the restoration of credit and investment capacity. Regression estimates confirm that a one-unit increase in CISI raises economic stability by 17–21%, and that institutional quality amplifies this effect, especially during crises.

Additional analysis of marginal effects allows us to assess how the impact of the credit and investment space on regional economic stability changes over time. Figure 1 shows the average marginal effects, accounting for institutional interaction and time shocks. In 2020, the total effect of the credit-investment space was 0.17, indicating the limited stabilising role of financial resources.

Figure 1. Marginal effect of the credit-investment space on the economic resilience of Ukraine's regions, 2020–2024



Note.
1) Total effect = baseline marginal effect of CISI + institutional reinforcement.
2) Values are interpreted as the change in the economic resilience index per one-standard-unit increase in CISI.
3) Interpretation of dynamics: 2020 – Limited stabilising role of finance; 2021 – Recovery and efficiency growth phase; 2022 – Partial mitigation of the crisis shock; 2023 – Adaptation and institutional strengthening; 2024 – Consolidation of the financial-institutional effect.
4) Average marginal effect of CISI on Res, accounting for institutional interactions and time effects.

The low effect is explained by the general slowdown in investment activity and increased uncertainty in the economic environment. In 2021, the total effect will increase to 0.23, reflecting the recovery phase of financial flows in the regions. The strengthening of institutional contributions indicates an increase in the effectiveness of transforming credit resources into economic stability. In 2022, the base effect of the credit-investment space will decrease to 0.09, reflecting the impact of a large-scale systemic shock. At the same time, institutional strengthening remains positive, providing partial compensation for the loss of economic stability.

In 2023, the cumulative effect increases to 0.21, indicating that the regions are transitioning to the adaptation phase. The increased role of institutional factors reflects a shift in stabilisation mechanisms from financial to organisational and regulatory. In 2024, the cumulative effect peaks at 0.26, indicating consolidation of the financial and institutional development model. The credit-investment space, combined with institutional quality, delivers the highest returns for regional economic stability. A comparative analysis of dynamics shows that institutional strengthening is playing an increasingly important role in the post-crisis period. This indicates a transformation of the credit-investment space from a quantitative source of financing to a structural factor of sustainable development.

As a robustness check, the baseline fixed-effects model was compared with a dynamic panel specification estimated using the Arellano–Bond estimator. The coefficients of CISI and institutional quality remained positive and statistically significant, confirming the stability of the main findings.

Table 4. Robustness checks

Variable	FE Baseline	Lagged FE	Dynamic Panel
CISI	0.214***	0.198***	0.183***
Inst	0.128**	0.121**	0.114**
CISI×Inst	0.083**	0.076**	0.071**
Observations	120	96	96

Notes: FE Baseline = original fixed-effects model; Lagged FE = fixed-effects model with lagged regressors; Dynamic Panel = model including lagged dependent variable. Standard errors are clustered by region. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

Source: author's development based on the results of an econometric model using data (National Bank of Ukraine, 2024; State Statistics Service of Ukraine, 2024; Ministry of Finance of Ukraine, 2024; State Treasury Service of Ukraine, 2024; World Bank, 2024; Organisation for Economic Co-operation and Development, 2023; International Monetary Fund, 2024).

The consistency of coefficient signs and significance levels across alternative specifications confirms the robustness of the empirical findings.

An additional hypothesis regarding the amplifying role of institutional quality in the transformation of financial resources is empirically confirmed by panel analysis. A positive, statistically significant interaction coefficient between the credit-investment space and the institutional variable indicates a complementary effect. In the crisis year of 2022, institutional quality partially mitigated the negative impact of the systemic shock on regional economic stability. The results confirm that without an adequate institutional environment, the stabilisation potential of the credit-investment space is significantly reduced.

4. Discussions

The identified complementarity between financial resources and institutions is consistent with approaches that treat development as a function of not only capital but also rules, transparency, and trust. In particular, index-based approaches to assessing budget transparency in sensitive sectors show that open financial management reduces risks by improving resource manageability (Nate *et al.* 2023). This supports our interpretation of institutions as a mechanism that increases the "return" on credit and investment in crisis conditions.

Our estimates for 2022–2024 show that the shock has reduced the marginal effect of financial space, but has not changed its positive sign. This trajectory is logical in the context of institutional challenges and financial market constraints during wartime, when resource availability is reduced, and transaction risks increase. The role of institutional strengthening during this period aligns with the thesis that anti-corruption mechanisms are needed to support the "financial security landscape" in the European integration framework (Kussainov *et al.* 2023). In this sense, our results are also consistent with comparative observations on anti-corruption regulation practices in the EU, which promote predictability and better resource allocation (Melnyk *et al.* 2022).

An important clarification is that the credit-investment space in Ukraine's regions is shaped not only through banking channels but also through the real sector's structure. This is particularly noticeable in agricultural regions, where clusters can increase cooperation, productivity, and the investment attractiveness of territories. The approach to the strategic formation of agricultural clusters confirms that organisational integration creates the preconditions for attracting capital and scaling up production (Sitnicki *et al.* 2024a). Our results support this logic through the positive impact of financial space, but complement it with an institutional channel, which is often mediated in cluster models.

One of the critical factors in regional investment activity is the land market and land rent, which affect investors' expected returns and risk. A comparative review of Poland and Ukraine emphasises the importance of land management mechanisms and rent processes in shaping incentives for land use (Marks-Bielska and Koshkalda, 2025). An analysis of the challenges of trade liberalisation and land reforms emphasises that institutional uncertainty deters investment, even when markets are formally opened (Ibatullin *et al.* 2024). In this context, our assessments of the interaction between the financial space and institutions explain why credit opportunities without regulatory certainty yield weaker returns.

The results regarding institutional strengthening can also be interpreted through the lens of social resilience, which is the "environment" in which financial mechanisms operate. Assessing the social resilience of the population in the Carpathian region shows that social conditions influence adaptation to shocks and recovery dynamics (Mulska *et al.* 2022). Our results do not directly measure social resilience, but they are consistent with the idea of

multi-channel resilience. This shows that purely financial interventions are ineffective without social and institutional support.

From the perspective of the digital transformation of financial infrastructure, our findings are consistent with the thesis that accounting and financial flow control tools need to be modernised. The development of blockchain technologies in financial accounting is seen as a way to increase transparency, traceability and trust, potentially reducing information asymmetry (Prokopenko *et al.* 2024). This resonates with our institutional channel, as more transparent and manageable processes enhance the efficiency of credit and investment resources. Similarly, the approach to strategic infrastructure transformation in the financial sector emphasises the importance of managerial changes to improve the performance of financial systems (Koldovskiy, 2024). The additional emphasis on sustainable development through the strengthening of Ukraine's financial infrastructure supports the conclusion that institutional reforms and environmental modernisation increase economic resilience (Koldovskyi, 2025).

At the same time, comparing our results with those presented in scientific sources allows us to refine our interpretation critically. Studies of clusters and land reforms demonstrate strong sectoral specificity, which can alter sensitivity to credit and investment (Sitnicki *et al.* 2024b; Ibatullin *et al.* 2024). This means that the aggregated financial space index may obscure distinct mechanisms across industrial, agricultural, and service regions. Anti-corruption and transparency approaches emphasise that the formal existence of institutions does not guarantee their effectiveness without implementation and oversight (Kussainov *et al.* 2023; Nate *et al.* 2023). Therefore, institutional quality should be detailed through indicators of compliance, accountability, and digital control tools.

Researchers Voznyak *et al.* (2023) examine the financial determinants of regional stability, emphasising the key role of credit availability during economic shocks. The results expand on these findings with a quantitative assessment of the marginal impact of credit-investment space during wartime. Kharlamova (2014) analyses the investment attractiveness of regions as a tool for rating and marketing territories. The positive effect of credit-investment space confirms this logic, complementing it with an institutional dimension.

At the same time, Misyuryov (2025) examines Ukraine's investment attractiveness amid global economic turbulence, emphasising the role of governance quality. A statistically significant interaction between the financial space and institutional quality empirically confirms this moderating effect. Nawaz *et al.* (2025) analyse the resilience of financial markets during the pandemic and military conflicts, focusing on institutional buffers. The study's results show that institutional quality partially mitigated the negative impact of the 2022 shock on regional economic resilience.

At the same time, Kravchenko *et al.* (2020) examine the socio-economic transformations of the agricultural sector, emphasising the importance of institutional coordination and access to finance. This is consistent with findings on the need for institutional reinforcement of financial resources to ensure long-term sustainability. Bas (2025) analyses the dilemma of globalisation and localisation, demonstrating the decisive role of local institutions in crisis conditions. This approach explains why institutional quality enhances the stabilising effect of the credit and investment space in the post-crisis period.

Finally, Stroiko *et al.* (2024) examine the ecosystem of women's entrepreneurship during wartime, pointing to the limited effectiveness of financing without institutional support. The results confirm a similar mechanism at the aggregate regional level. Onegina *et al.* (2025) analyse the innovative potential of small and medium-sized enterprises in the agricultural sector, emphasising the complementarity of finance and institutions. This further confirms the conclusion that expanding the credit-investment space without institutional modernisation is insufficient.

Overall, the discussion confirms that our results are consistent with most conclusions about the role of institutions, transparency, and reforms in improving investment efficiency. At the same time, they complement these approaches with a quantitative assessment of the complementarity between the financial space and institutions at the regional level. Taken together, this supports the practical conclusion that credit and investment policy needs to be synchronised with anti-corruption governance, budget transparency and the modernisation of financial infrastructure.

5. Limitation

The study is limited by the availability and completeness of regional financial data, which necessitates using aggregate indicators of the credit and investment sectors. The construction of integrated indices may partially smooth out intra-regional differences and conceal the structural heterogeneity of financial processes. Although additional robustness checks based on lagged explanatory variables and dynamic panel specifications were performed, potential endogeneity between economic resilience and financial development cannot be entirely eliminated due to data limitations and the relatively short time horizon. The impact of informal institutions and

military risks cannot be quantified and remains outside the scope of empirical analysis. The results obtained are interpreted within the period 2020–2024 and can be extrapolated to a limited extent to the long term.

Conclusions

The growth of regional disparities in access to financial resources increases the importance of studying mechanisms of economic stability in a transitional economy. Military and macroeconomic shocks highlight the need for a quantitative assessment of the roles of the credit-investment space and institutional factors at the regional level. The article achieves its goal by comprehensively assessing the impact of the credit-investment space on the economic stability of Ukraine's regions. The integrated indicator developed enabled a quantitative assessment of regional differences in access to credit and investment resources.

The constructed panel econometric model confirmed the statistically significant positive impact of credit-investment space on economic stability. The results show that a one-unit increase in credit and investment improves regional economic stability by an average of 17–26%. Institutional quality demonstrates an independent positive effect of 11–13% in various specifications of the panel model. The multiplier effect of the interaction between the financial sector and institutional quality exceeds 7%, strengthening the regions' stabilisation potential. Despite the systemic shock of 2022, regions with higher financial and institutional indicators lost approximately 30% less economic stability. It has been established that institutional quality acts as an independent stabilising factor and enhances the effect of financial resources. In the crisis year of 2022, institutional mechanisms partially offset the negative impact of external shocks on the regional economy.

A comparative analysis of dynamics for 2020–2024 showed an increased role of institutional factors in the post-crisis period. The results confirm that effective transformation of the credit-investment space is impossible without an adequate institutional environment. Thus, all research objectives have been achieved, and the hypotheses have been empirically confirmed. The general conclusions point to the need to combine financial and institutional instruments in regional economic policy. The credit-investment space should be viewed not only as a source of financing but also as a structural element of economic stability. Further research should focus on extending the analysis timeframe and accounting for spatial interregional effects. A promising area is assessing the impact of digital financial instruments and informal institutions on regional economic stability.

Declarations:

Credit Authorship Contribution Statement:

Myroslav Khomyak: Conceptualization, Investigation, Methodology, Project administration, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Funding acquisition;
Yevhen Shkurov: Conceptualization, Investigation, Methodology, Project administration, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Funding acquisition;
Ivan Bakalo: Conceptualization, Investigation, Methodology, Formal analysis, Writing – original draft, Supervision, Writing – review and editing.
Olena Golovina: Conceptualization, Investigation, Methodology, Software, Writing – original draft, Writing – review and editing, Visualization.
Borys Bezzubko: Conceptualization, Investigation, Methodology, Software, Formal analysis, Writing – original draft, Writing – review and editing, Visualization.

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