

Architecture of the banking system of Ukraine under destructive challenges

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ABSTRACT: This study examines Ukraine's banking system architecture amid unprecedented destructive challenges including geopolitical tensions, macroeconomic instability, and technological advancements. Using systemic and institutional approaches with statistical and analytical methods, we evaluate the banking system's capacity for self-organization and adaptation. Results indicate Ukraine's banking system demonstrates dual nature – rapid adaptation to external shocks while remaining vulnerable to prolonged crises. Institutional flexibility emerges as crucial for enhancing resilience, with adaptability manifested through structural reconfiguration and proactive risk management. Analysis of the Financial Stress Index reveals how military aggression, exchange rate volatility, and macroeconomic factors affect financial stability. International financial organizations play a vital role through external funding and regulatory standards implementation. Government support, particularly the “5-7-9%” program, has effectively provided financing for SMEs with 69,691 loans totaling 273.1 billion of UAH issued during martial law. The research develops conceptual frameworks for strategic banking system adaptation based on seven complementary approaches that collectively enhance the sector's institutional capacity amid uncertainty.

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Introduction

The central research problem centres on the institutional architecture of Ukraine's banking system and its mechanisms for adaptation amid unprecedented destructive challenges aimed at financial stability. While Ukraine's banking sector underwent significant reforms following the 2014-2015 crisis, the full-scale military invasion of February 2022 introduced fundamentally new challenges that render previous reform experiences insufficient for current realities. The banking sector now operates under conditions without precedent in modern European history: geopolitical fluctuations, prolonged hybrid war of the Russian Federation, macroeconomic instability, monetary policy imbalances, digitalization of financial ecosystems, systematic infrastructure destruction, massive population displacement.

The urgency of this research stems from three critical factors. First, Ukraine's banking system offers unique insights into financial system resilience under extreme conditions, providing evidence essential for crisis preparedness in an increasingly unstable global environment. Second, the system's adaptation mechanisms directly influence Ukraine's economic survival and post-war reconstruction capacity, making this analysis crucial for international support strategies and policy design. Third, as other nations face growing geopolitical tensions and potential conflicts, Ukraine's experience offers invaluable lessons for banking system architecture and crisis management protocols.

The research significance transcends Ukraine's national borders. From a theoretical perspective, it advances the understanding of banking system adaptability by introducing new conceptual approaches to institutional plasticity and strategic reconfiguration under extreme conditions. This contributes to the international discourse on banking system resilience, particularly relevant for emerging economies and conflict-affected regions worldwide. The findings challenge existing crisis management theories developed primarily for peacetime economic shocks, necessitating new frameworks for wartime financial stability.

The practical relevance is demonstrated through immediate policy applications. International financial organizations, including the IMF, World Bank and EU institutions, require evidence-based frameworks for supporting banking systems in conflict zones. The study's analysis of adaptation mechanisms and policy instruments directly informs current decision-making processes for Ukraine's financial sector and establishes best practices for similar future scenarios. Moreover, as Ukraine progresses toward EU integration, understanding the compatibility between wartime adaptations and European banking standards becomes critical for regulatory harmonization.

This research is positioned at the intersection of banking, institutional economics, and financial stability studies, contributing to the theoretical understanding of banking system resilience under extreme conditions. The study addresses a critical gap in contemporary banking literature regarding the institutional transformation of banking systems in countries facing multiple concurrent challenges.

The banking system transformation during crisis periods has attracted significant scholarly attention. Recent research by Anginer et al. (2021) emphasizes the importance of institutional factors in crisis prevention, while Berger and Roman (2020) highlight organizational flexibility in maintaining banking system stability. Laeven et al. (2016) analyzed global banking systems' responses to various crises, providing comparative assessment frameworks. In the Ukrainian context, Arzhevitin et al. (2023) and Meshcheriakov et al. (2023) examined adaptation mechanisms during military conflict. Digital transformation aspects were explored by Frost et al. (2021) and Bukhtiarova et al. (2020), while regulatory frameworks were analyzed by Beck (2024) and Khokhych et al. (2023).

While existing literature offers valuable insights into various dimensions of banking system transformation, several gaps persist. Firstly, there is a lack of extensive research on the adaptation of banking systems during prolonged military conflicts. Secondly, the relationship between institutional resilience and digital transformation warrants further exploration. Lastly, a more in-depth analysis is needed regarding the role of international financial organizations in bolstering banking system stability during crises.

The research hypothesis suggests that the national banking system's effectiveness in supporting economic growth depends on alignment between state regulation mechanisms and optimal system requirements, coupled with internal self-organization potential activated through institutional plasticity, structural reconfiguration, and proactive development strategies.

The purpose of the study is to present a thorough scientific rationale for the methodological principles and practical mechanisms for the institutional transformation of the banking system of Ukraine in the face of critical challenges.

The main objectives of the study include the development of conceptual approaches to strategic adaptation, identification of systemic determinants of transformation processes, substantiation of methodological tools for assessing institutional sustainability, and the formation of proposals to ensure the resilience of the banking system in the context of permanent uncertainty and asymmetric threats of the global and local environment.

The methodological framework integrates systemic, complementarity, emergence, and structural dynamics principles, enabling the formation of a conceptual matrix for transformation processes and identification of key institutional development vectors in Ukraine's banking system amid global economic transformations.

Literature Review

The institutional transformation of banking systems during crisis periods has attracted significant scholarly attention. This review systematizes current research in several key dimensions, focusing on banking system resilience, crisis management, digital transformation, and regulatory frameworks.

Recent studies in banking system architecture emphasize the importance of institutional resilience in crisis conditions. Anginer et al. (2021) developed a comprehensive framework for assessing banking system stability, highlighting the role of institutional factors in crisis prevention. This aligns with Berger and Roman's (2020) findings on the importance of organizational flexibility in maintaining banking system stability. Ukrainian researchers Arzhevitin et al. (2023) provide valuable insights into how banking institutions maintain operational stability under martial law, demonstrating both challenges and adaptation mechanisms.

The banking sector's response to crisis conditions has evolved significantly. Laeven et al. (2016) analyzed global banking systems' responses to various crises, providing a comparative framework for assessment. This global perspective is complemented by regional studies, such as Barna and Ruschysyn's (2020) analysis of Ukraine's banking system development in the context of structural reforms. Meshcheriakov et al. (2023) further extended this research by examining specific adaptation mechanisms during military conflict, offering unique insights into crisis management under extreme conditions.

Digital transformation has emerged as a critical factor in banking system evolution. Frost et al. (2021) examined how technological innovation reshapes banking architecture, while Trusova et al. (2021) specifically focused on payment systems risks in Ukrainian banking institutions. The intersection of digital innovation and institutional stability is explored in recent work by Bukhtiarova et al. (2020), who assessed financial monitoring efficiency in Ukraine's banking system.

The regulatory landscape continues to evolve in response to new challenges. Zeman et al. (2018), Beck (2024) provided a comprehensive analysis of post-crisis regulatory reforms. Khokhych et al. (2023) examined specific aspects of central bank reserves management. Sobolieva-Tereshchenko and Zhukova (2020) contributed valuable insights into stress testing methodologies for banking systems, particularly relevant for emerging economies.

Numerous scholars have examined the problematic aspects of the banking system, emphasizing the diverse directions of its development. However, the challenge of creating integrated mechanisms for evaluating the institutional stability of the banking system and devising adaptive strategies for development amidst ongoing destructive challenges and uncertainty provides a foundation for further research. While existing literature offers valuable insights into various dimensions of banking system transformation, several gaps persist. Firstly, there is a lack of extensive research on the adaptation of banking systems during prolonged military conflicts. Secondly, the relationship between institutional resilience and digital transformation warrants further exploration. Lastly, a more in-depth analysis is needed regarding the role of

international financial organizations in bolstering banking system stability during crises. This study aims to address these gaps by examining the intricate interplay between institutional adaptation, regulatory evolution, and digital transformation within Ukraine's banking system, with a specific emphasis on resilience mechanisms in the face of unprecedented challenges.

Materials and methods

This study employed a multi-stage research methodology designed to comprehensively analyze the institutional architecture of Ukraine's banking system under destructive challenges. The research was conducted in three sequential phases, each utilizing specific methods to address particular aspects of the research objectives.

Phase 1: Assessment of Institutional Sustainability. The phase focused on evaluating the banking system's resilience mechanisms. We utilized system analysis to examine the banking system as a complex dynamic structure, allowing us to identify systemic vulnerabilities and adaptation capabilities. The institutional method facilitated investigation of both formal regulations and informal practices that shape the banking system's development. Statistical and analytical methods were applied to quantitative indicators from the NBU's database, including capital adequacy ratios, liquidity indicators, and profitability metrics. This data was analyzed using comparative analysis across different time periods (pre-war, early war phase, and current adaptation phase) to identify temporal patterns in system resilience.

Phase 2: Analysis of International Financial Support Mechanisms. This phase examined the role of international financial organizations in strengthening Ukraine's banking architecture. We analyzed cooperation memorandums between Ukraine and international financial institutions, particularly focusing on the IMF's recommendations outlined in the 2022-2024 program documents and the Ukraine Facility Plan. The method of grouping was employed to classify financial support initiatives according to their targeted impact areas. Statistical data on international aid flows from 2022 to 2024 was visualized using the graphical method to identify patterns and trends in external support dynamics.

Phase 3: Conceptualization of Strategic Adaptation Approaches. The final phase involved developing conceptual frameworks for strategic adaptation of the banking system. The abstract and logical method was used to formulate theoretical assumptions based on the findings from previous phases. We employed synthesis to integrate the identified factors into a cohesive conceptual matrix, enabling the formation of strategic approaches to institutional transformation. The dialectical approach helped uncover contradictions and changes within the system in response to external and internal challenges, particularly focusing on the banking system's operations under martial law conditions and post-war reconstruction needs.

The methodological framework of the study is grounded in the principles of holism, nonlinearity, and structural dynamics, which are particularly relevant for analyzing complex adaptive systems under turbulent conditions. These principles were chosen

because they enable comprehensive analysis of system-wide transformations while accounting for emergent properties and non-linear responses to external shocks – characteristics that traditional linear analysis methods often fail to capture.

For empirical analysis, we utilized statistical data from the National Bank of Ukraine’s banking supervision department, focusing specifically on the Financial Stress Index, Geopolitical Risk Index, and financial sector risks heatmap from 2016 to 2024. Data on the “5–7–9%” program performance was obtained from official Ministry of Finance of Ukraine reports. To ensure data validity, only official statistics from regulatory authorities were used, with cross-verification across multiple reports where possible.

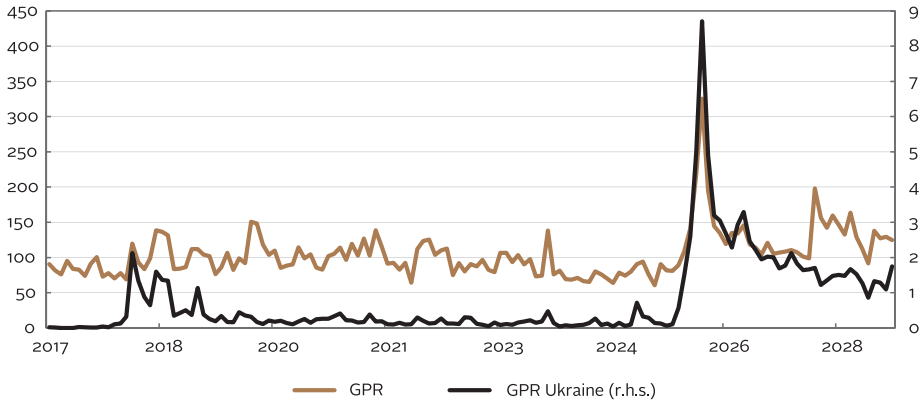
The combination of qualitative and quantitative methods provided methodological triangulation, enhancing the reliability of findings. The qualitative analysis of institutional frameworks complemented the quantitative assessment of financial indicators, allowing for a comprehensive understanding of both structural elements and performance dynamics of Ukraine’s banking system under destructive challenges.

RESULTS

Impact of geopolitical and macroeconomic factors on the banking sector’s resilience

The risks of further prolongation and escalation of the war still exist, although market reactions suggest that the involved parties are becoming increasingly optimistic about the end of hostilities. International support has expanded due to the use of profits from frozen Russian assets, and Europe’s role in providing financial assistance to Ukraine has increased. Partner countries’ economies have grown moderately, bolstering demand for Ukrainian exports, and price conditions for Ukrainian foreign trade have improved. However, the risks of global trade fragmentation have risen. Figure 1 illustrates the Geopolitical Risk Index (GPR) for the world and Ukraine.

Figure 1. Geopolitical Risk Index (GPR) globally and in Ukraine

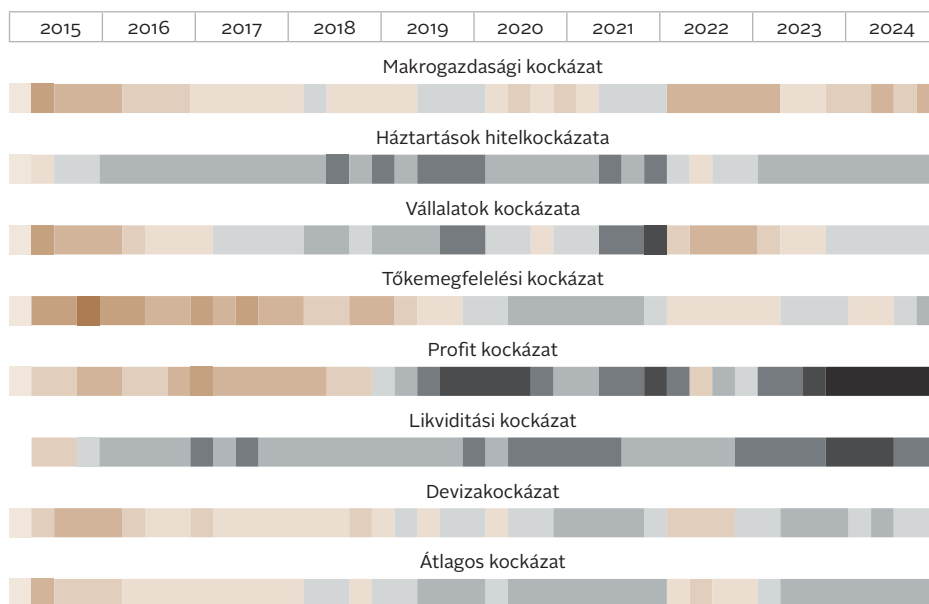


Source: National Bank of Ukraine; Caldara, D., & Iacoviello M. (2022).

It is crucial to examine the heat map that depicts the risks to Ukraine’s financial sector, as illustrated in Figure 2. This heat map offers a comprehensive evaluation of potential threats to the stability of the national financial system. Covering the years from 2016 to 2024, the map highlights the evolution of various risk intensities over time, with color gradations representing the level of threat – red indicating a high level of risk and blue signifying a low level. Throughout this period, macroeconomic risks have exhibited significant volatility, with a pronounced increase anticipated in 2024.

Since 2016, credit risk has predominantly trended downward, though a slight increase has been observed in recent years. Operational and profitability risks have exhibited moderate fluctuations, characterized by periodic changes. Of particular significance is the marked reduction in legal and liquidity risks compared to the beginning of the analysis period, signaling positive advancements in the regulatory environment and enhanced liquidity management within the banking sector.

Figure 2. Financial sector risk heatmap



Source: National Bank of Ukraine.

Transformational trends in the banking system of Ukraine in the context of destructive challenges

The modern banking system in Ukraine is confronting unprecedented transformational challenges driven by a combination of disruptive geopolitical, economic, and institutional factors. Military aggression, ongoing macroeconomic instability, significant structural imbalances, and rapid technological advancements are establishing a fundamentally new environment for the operation of financial and credit institutions. In the context of post-war reconstruction, the banking system must adapt to new economic realities, which include increasing lending for infrastructure rebuilding, supporting small and medium-sized enterprises, and implementing mechanisms for preferential financing of strategic industries.

To gain a deeper understanding of the identified trends and support the conclusions, it is essential to analyze empirical data and provide specific examples that demonstrate the practical application of theoretical concepts. This approach will not only enhance the scientific rigor of the conclusions but also offer a more comprehensive examination of the mechanisms through which the Ukrainian banking system adapts to destructive challenges. Special attention will be devoted to analyzing statistical indicators that reflect changes in the structure of the banking sector, its operational efficiency, and the dynamics of key financial metrics, allowing

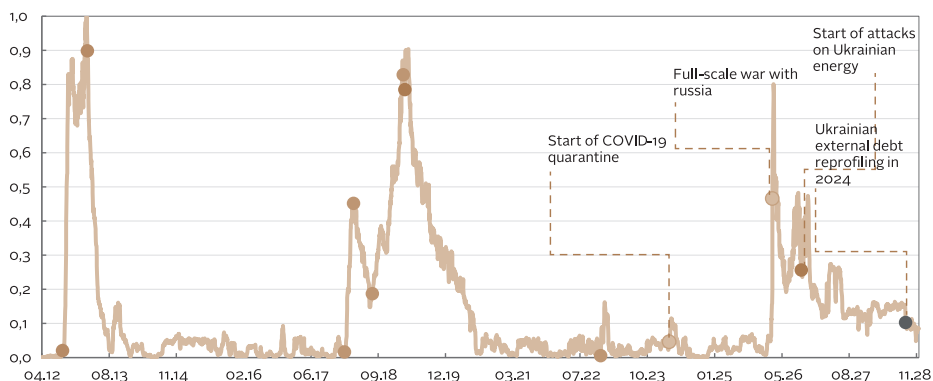
us to uncover patterns that may be overlooked in purely theoretical analysis. By integrating both quantitative and qualitative analytical methods, we can create a multidimensional overview of the transformation processes. Ultimately, this will enable the formulation of targeted recommendations aimed at improving the efficiency and resilience of the banking system in the context of postwar reconstruction.

Thus, the priority areas of banks' activities include diversifying anti-crisis financial instruments, ensuring the continuity of economic processes, and establishing the necessary foundations for the post-war economic reconstruction of the state.

Therefore, as part of our study, we will examine the Financial Stress Index (FSI), an indicator that reflects the level of stress within Ukraine's financial sector. The FSI ranges from 0 to 1, where 0 signifies a complete absence of stress and 1 indicates the highest level of stress. While the FSI provides insight into the current state of affairs, it does not predict future risks. The FSI serves several purposes: it measures the stress level in the financial system; assesses both the depth and duration of periods of financial market instability, allowing for comparisons with stress levels during past crises; evaluates the effectiveness of anti-crisis measures in conjunction with other indicators; and helps determine the nature of shocks to the financial system and its individual components, whether they are systemic or episodic (NBU, 2024c).

Figure 3 shows the key events that affected the financial market of Ukraine. In particular, shortly after the bankruptcy of Lehman Brothers, the FSI peaked. The subsequent rapid growth of the FSI during the 2014-2015 crisis, although lower in level, was much longer in duration. Only after the start of negotiations on public debt restructuring in 2015 did the level of stress begin to decline significantly. After the quarantine was announced in March 2020, the index temporarily increased, but in early June it dropped to the level observed before the COVID-19 pandemic. Russia's full-scale invasion in 2022 caused a sharp rise in the index. All of its components grew, indicating that the stress on the financial sector is systemic. Initially, the high values of the FSI were driven by rising securities market yields, exchange rate volatility in the cash foreign exchange market, high levels of foreign exchange interventions, and NBU refinancing of banks to maintain their liquidity. Only the level of the sub-index of household behavior remained relatively low, as households' confidence in the banking system remained high and there was no deposit outflow, which restrained the growth of the overall index. Subsequently, most of the sub-indices declined. However, in July, yields on government and corporate securities rose sharply in anticipation of the restructuring of public debt. Household deposit rates also rose, and volatility in the cash foreign exchange market persisted. As a result, the FSI rose to its March level.

Figure 3. Financial Stress Index (2008-2024)



Note: Starting from the beginning of 2023, the components of the government securities sub-index were adjusted: the average yield of sovereign Eurobonds was estimated excluding instruments maturing before the date of the planned restructuring in 2024; the price of credit default swap, which has not been estimated since August 2022, was excluded (the value of August 2022 was used before).

Source: National Bank of Ukraine.

After a successful debt restructuring and a temporary decline in the index, the attacks on energy infrastructure presented a new shock to the system. The banking and currency sub-indices immediately rose as fluctuations in the cash exchange rate intensified. High values in several indices increased the level of stress. However, in early November 2023, as the economy adjusted to the new attacks, the Financial Stability Index (FSI) began to decline. Overall, in 2023, volatility at high levels of the FSI persisted, with simultaneous movements in several sub-indices being the main reason for this growth. The household behavior sub-index gradually increased, primarily due to higher interest rates on hryvnia deposits. This rise in interest rates is not associated with deposit outflows, so it does not signal additional pressure on liquidity. However, it reflects tighter monetary conditions, which present additional challenges for the financial system. The banking sub-index also increased due to a slight decline in liquidity, yet it remained the lowest among all the FSI components. The government securities sub-index stayed elevated, given the high yields on sovereign Eurobonds. At the same time, the narrowing spread between the official and cash exchange rates, along with the NBU's reduced foreign exchange interventions, resulted in a gradual decline in the foreign exchange (FX) sub-index. Since September 2024, the FSI has experienced a marked decline, primarily due to a significant drop in the government securities sub-index. This decline was driven by the restructuring of external public debt and a corresponding decrease in sovereign Eurobond yields, while yields on hryvnia domestic government bonds also fell slightly. Since that point, the most pressing issue affecting the Financial Stability Index has been the persistently elevated level of the FX sub-index, primarily caused

by the NBU's extensive interventions in the foreign exchange market. Meanwhile, the sub-index reflecting household behavior has been steadily improving due to an influx of funds into accounts. Additionally, an increase in the prices of Ukrainian corporate bonds has bolstered the corporate securities sub-index. However, the banking sub-index continues to lag behind the others, remaining at the lowest level, despite a slight decrease in liquidity coverage ratios resulting from the NBU's hike in required reserves. It is crucial to note that the FSI reflects only the current state of the financial sector and does not indicate any potential risks, either in the near term or the distant future (NBU, 2024a).

Based on the analysis of the dynamics of the Financial Stress Index (FSI) and other indicators for 2022-2024, a three-phase model of the transformation of the banking system in conditions of a protracted conflict was first identified as follows:

- ▶ Shock absorption phase (first 3-4 months) – characterized by a sharp increase in FSI to 0.8, a reduction in liquidity by 30-35% and a reorientation of operational processes.
- ▶ Functional adaptation phase (4-12 months) – manifested in the stabilization of FSI at the level of 0.3-0.5, the restoration of operational processes and the introduction of temporary adaptation mechanisms.
- ▶ The structural reconfiguration phase (after 12 months) – characterized by a gradual decrease in FSI to 0.2-0.3, the formation of new business models and the active development of digital channels (an increase in digital transactions by 60% compared to the pre-war period).

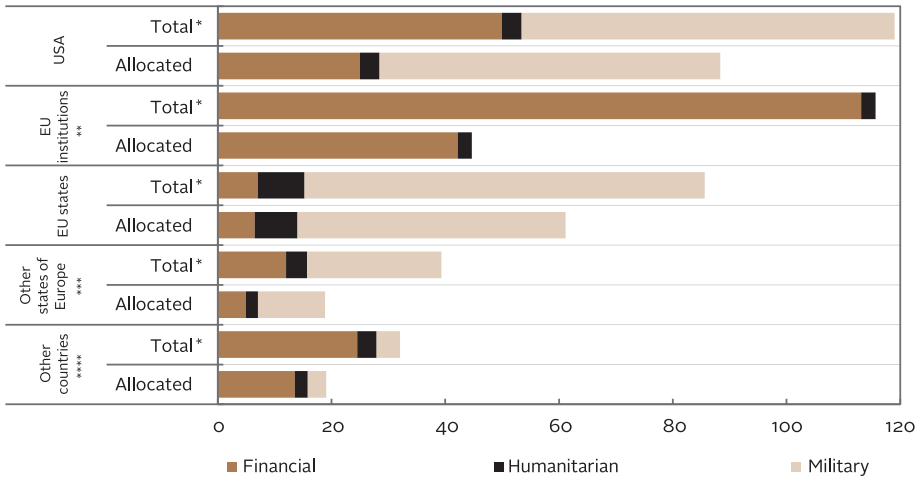
This cyclical pattern is fundamentally different from the two-phase model observed during the economic crises in Ukraine of 2009-2010 and 2014-2015. This three-phase framework enables central banks to optimize crisis resource allocation: allocating 30-35% additional liquidity reserves during phase I, implementing targeted operational support in phase II, and planning long-term structural adaptations in phase III. The empirically validated timelines provide crisis management benchmarks for banking regulators worldwide. Countries dealing with geopolitical tensions, such as the non-EU Balkan countries, could implement this model to bolster the resilience of their banking sectors ahead of potential crises, facilitating proactive rather than reactive crisis management.

The study revealed atypical patterns of adaptation of the Ukrainian banking system during a prolonged military conflict. Unlike the traditional short-term crisis scenarios outlined in existing literature, the Ukrainian banking system exhibits the phenomenon of dual institutional plasticity. This phenomenon is defined by a simultaneous increase in regulatory rigidity at the macro level and enhanced operational flexibility at the micro level. This concept enables emerging market central banks to maintain international credibility while ensuring domestic operational flexibility through graduated compliance frameworks that automatically adjust requirements based on crisis severity without compromising long-term institutional integrity.

The role of international financial organizations in strengthening Ukraine's banking architecture

Ukraine is proactively enhancing its defense posture in response to evolving security threats, resulting in a significant uptick in domestic military production. Currently, Ukraine has established 27 security agreements with various countries, encompassing all G7 nations, the European Union, and the majority of its member states. This trend underscores the robust commitment of these nations to extend continuous military assistance to Ukraine. An overview of the official assistance provided to Ukraine from January 2022 through October 2024 is illustrated in Figure 4.

Figure 4. Committed official assistance for Ukraine from January 2022 through October 2024, euro billions



Source: National Bank of Ukraine; Kiel Institute for World Economy; Antezza, A. et al. (2022).

Stable external financing remains essential for maintaining macroeconomic stability amid the ongoing conflict. International support for Ukraine continues to be robust. In October 2024, G7 leaders reached an agreement to extend approximately \$50 billion in aid to Ukraine through the Extraordinary Revenue Acceleration (ERA) program. This aid package is set to be funded by the interest and principal from immobilized Russian assets. The allocated funds will primarily be directed towards budgetary and military assistance and will be distributed based on bilateral agreements. The European Union has already committed a significant portion of this support to Ukraine. However, the disbursement of funds under this program will depend on the fulfillment of the conditions outlined by the Ukraine Facility. Furthermore, the terms for a \$20 billion loan from the United States have been established as part of the G7 arrangement through the World Bank.

The government agencies are making steady progress with their reforms, which has enabled the country to successfully pass the sixth review under the IMF (NBU, 2024b) program and continue its collaboration with the EU through the Ukraine Facility. However, additional reforms are necessary to ensure a consistent influx of financial resources, particularly regarding the new macro-financial assistance program under the ERA (NBU, 2024a).

Efforts to strengthen Ukraine's banking architecture are closely aligned with the recommendations from the IMF outlined in the cooperation memorandums. These recommendations advocate for a comprehensive transformation of the financial sector, which includes enhancing the institutional capacity for banking oversight, increasing the capitalization levels of banking entities, developing mechanisms for financial stability, improving corporate governance practices, and adopting risk-based approaches. Given the substantial liquidity presently available and anticipated within the banking system, Ukraine is actively seeking ways to bolster bank funding. This entails evaluating liquidity flows into the banking sector at both the individual bank and bank-group levels to devise targeted strategies that encourage heightened purchases of government bonds. A collaborative working group under the Financial Stability Board (FSB) will facilitate these efforts. By implementing a well-balanced mix of strategies, these initiatives can help secure net domestic financing throughout the program's duration (MoF, 2024). Successfully placing domestic debt securities, combined with timely external financing on favorable terms, will enable the execution of the budget as planned, avoid incurring additional debt, and minimize reliance on equity financing. Ultimately, this approach aims to finance the budget in a manner consistent with our objectives of safeguarding macroeconomic and financial stability while restoring debt sustainability.

With support from technical assistance provided by the IMF and other partners, Ukraine is analyzing the practices of European national central banks, reviewing the accounting and financial reporting framework within the European System of Central Banks (ESCB), and evaluating the NBU's readiness to adopt ESCB standards. Decisions made in this context will align with the broader strategy of reducing state ownership in the banking sector. Any decision that potentially increases state ownership in the banking sector will be developed in consultation with IMF experts and will be strictly limited to matters concerning financial stability and national security during martial law. All systemic banks with majority state ownership will continue to operate under the jurisdiction of the Ministry of Finance of Ukraine, while any non-systemic banks that become state-owned will not receive budget funding but will be handed over to the Deposit Guarantee Fund for resolution in cases of violations of prudential requirements.

In the coming years, it will be essential to establish and implement a mechanism for making informed decisions regarding any additional banks that come under state control. This process aims to preserve value, ensure effective operational management, and determine the future direction of these banks. Continuous analysis of the banking system's state, alongside wartime developments and needs, will be crucial. Based on the NBU resilience assessment, capital management

plans have been devised, and the business plans of state-owned banks requiring increased capital to meet regulatory standards have been adjusted. As a shareholder, the Ministry of Finance has provided direction for these banks to align with international best practices concerning risk appetite. The NBU will evaluate their risk appetite strategies in a thematic review as part of the 2025 Annual Supervisory Review and Evaluation Process (SREP). Following the completion of the independent asset quality assessment, we will leverage its findings to refine the overall reform strategy for the state-owned banking sector, as well as the individual strategies for each state-owned bank, including plans for privatization in accordance with the Financial Sector Development Strategy. To prepare for the privatization of majority state-owned banks, Parliament passed a law governing the privatization of these banks in October 2024. By the end of March 2025, an internationally recognized financial advisor will be appointed through a transparent process, in consultation with international financial organizations. It is important to note that the General Privatization Law does not apply to the privatization of state-owned banks.

The NBU has revised the structure of banks' regulatory capital and the methodology for calculating the leverage ratio to ensure alignment with European Union standards. With support from the World Bank, significant gaps in the regulatory capital requirements are anticipated to be addressed by the end of June 2025, with further gaps to be addressed thereafter. The implementation of these new requirements will be phased, allowing banks to effectively integrate them into their business strategies. To comply with the EU Directive, the NBU intends to enact legislative changes that will increase the minimum share capital requirement for banks to €5 million or its equivalent by the end of January 2025, providing existing banks with a six-month transition period. The NBU will continue to monitor the economic landscape, relax control measures, and consider a return to pre-war regulations when conditions are deemed safe. This will depend on banks meeting the new capital requirements aligned with EU standards, based on resilience assessments, while also factoring in the banking system's critical role in supporting the economy and participating in the domestic debt market.

The supervision of hybrid business models in banks has gained increasing importance due to the growing prominence of frameworks such as Bank as a Service. This model enables banks to seamlessly integrate their digital banking services with those offered by non-banking entities. In October 2024, following consultations with experts from the IMF, the NBU published a policy paper addressing the distinct risks associated with these business models, including operational resilience, the impact of critical third parties, and concerns related to anti-money laundering and counter-terrorism financing (AML/CFT). To tackle the escalating risks posed by critical third parties, a concept centered on monitoring these entities and enhancing digital operational resilience is anticipated to be finalized by the end of February 2025. Additionally, a proposed draft law, known as a structural beacon, will be developed and submitted to the Verkhovna Rada by the end of May 2025. This initiative will be conducted in collaboration with international financial institutions (IFIs) and will encompass strategies to identify, contain, and mitigate risks associated with

critical third parties, focusing both on the operations of these institutions and their resolution processes. Entities classified as critical third parties must adhere to the NBU's standards for business reputation and professional suitability.

Another significant impetus for the institutional transformation of Ukraine's banking system is the Ukraine Facility Plan, which establishes a methodological framework for strategic restructuring. The implementation of this plan aims to enhance the institutional architecture of Ukraine's banking sector by introducing a comprehensive financial support mechanism. This mechanism not only concentrates on attracting external resources but also fosters systemic transformation of internal components, promoting the development of adaptive strategies, innovative financial instruments, and a proactive anti-crisis approach that allows for continuous modifications in response to external changes. Specifically, the plan includes restoring stability assessments, conducting asset quality inspections for the largest banks, gradually reducing state ownership in the banking sector, addressing the challenges of non-performing loans (NPLs), and improving state oversight of capital and organized commodity markets. The anticipated outcome of implementing the Ukraine Facility Plan is to strengthen the resilience of the banking system, enhance lending conditions for businesses, and boost investor confidence in the sector (MoE, 2024).

The interaction between banks and IFIs in the transformation of Ukraine's banking system unfolds as a multifaceted strategic partnership. This collaboration creates a complex institutional framework for global financial integration. The interaction is grounded in the principles of systemic convergence, with IFIs acting as pivotal catalysts for institutional change. They facilitate the adoption of advanced regulatory mechanisms and innovative financial tools, allowing for the continuous reconfiguration of Ukraine's banking system to address global challenges. This approach is essential for ensuring strategic resilience amid ongoing economic uncertainties.

Thus, in contrast to classical models of interaction between IFIs and the banking systems of developing countries, Ukraine has developed a modified mechanism of influence characterized by several key features: accelerated institutionalization; simultaneous multichannel integration via institutional channels, including the cooperation framework established with the IMF, World Bank, EU through the Ukraine Facility, the working group under the Financial Stability Board (FSB), G7 through the Extraordinary Revenue Acceleration (ERA) program, and the European System of Central Banks (ESCB); and adaptive nature of regulatory requirements (a flexibility in applying Basel III and IV regulations, taking into account the military realities faced by the country). This mechanism showcases a distinctive model for transforming the banking system, where reliance on resources from international financial institutions can have uncertain effects on the national financial and banking security – a phenomenon not commonly seen in other countries facing similar challenges.

The multi-channel integration mechanism demonstrates how coordinated simultaneous support accelerates aid delivery and reduces administrative burden

compared to traditional sequential bilateral assistance, providing a replicable template for other post-conflict reconstruction scenarios, especially in regions that require the swift adoption of EU or international standards. The experience in Ukraine illustrates that accelerated regulatory convergence can be achieved without sacrificing institutional quality when there is proper coordination.

Adaptation mechanisms of banking institutions amidst martial law

In May 2023, the NBU launched an ambitious strategy called “Financial Fortress.” This initiative focuses on effectively countering the challenges posed by Russian aggression while advancing the nation’s rebuilding efforts. In 2024, the NBU made significant updates to its strategy to enhance its response to escalating Russian threats and promote national recovery. These improvements empower the NBU to quickly adapt to a rapidly changing environment and prepare for new challenges ahead. By the end of 2024, the NBU conducted a thorough review and expanded its plans to align with its strategic objectives, refining the metrics for measuring success. Consequently, it introduced 11 new success indicators while improving six existing ones. The updated roadmap includes 17 new initiatives and 45 revised actions intended to tackle current challenges directly (NBU, 2025).

The NBU’s priorities have been enhanced to incorporate several relevant measures and updated indicators:

1. Focus on ambitious targets for price stability, inflation expectations, and exchange rate resilience.
2. Introduce measures for financial sector continuity, risk management in banks, connections with aggressor state ownership structures, fraud prevention, and critical infrastructure resilience.
3. Prioritize integration into the EU financial market, develop ESG policies, uphold corporate governance standards, promote financial inclusion for war veterans, boost lending, and enhance financial literacy. Key indicators include negotiating Ukraine’s EU accession.
4. Strengthen oversight of cyber resilience and digital operations, regulate virtual assets, improve cash circulation models, and prohibit software from associated aggressor countries.
5. Expand measures for continuous NBU functionality, develop security systems, implement ESG policies, enhance innovation capabilities, explore AI applications, and support war veterans’ reintegration.

Alongside, the NBU was introducing new requirements for banks to align with European Union regulations. Starting in 2025, banks will be mandated to calculate the leverage ratio in a test environment, report on their internal liquidity adequacy assessment process (ILAAP), and submit a supplementary report on internal capital adequacy assessment process (ICAAR). Furthermore, they must comply with the regulatory capital ratio, which is set to gradually rise to a minimum of 10% by July 2025. Additionally, banks are required to consider the increase in the corporate

income tax rate to 50% for 2024 when formulating their business plans for 2025. Institutions undertaking restructuring programs based on the 2023 sustainability assessment should assess whether adjustments to these programs are necessary in response to the updated taxation guidelines (NBU, 2024a).

The NBU is currently refining its regulatory framework to better align with European standards. It will soon finalize new guidelines detailing how banks should compute the minimum capital required to mitigate credit and settlement risks. The implementation timeline for these guidelines will be contingent on the results of test calculations. Looking towards 2025, the NBU aims to enhance its requirements for the development of third-party risk management systems within banks. In line with its updated strategy to promote sustainable finance, the NBU is also preparing to release a White Paper on ESG policies next year. This document will act as a roadmap for gradually adopting European best practices in managing environmental and social risks within the financial sector (NBU, 2024a).

The consistent improvement of risk management mechanisms creates favorable conditions for the development of financial instruments aimed at supporting the economy. One of the key areas of such support is the development of lending programs that help strengthen the business environment and stimulate economic growth. In this context, it is important to note the role of the “5–7–9%” program, which aims to support small and medium-sized businesses (SMEs) by providing soft loans.

Since the program’s start, 104,513 loan agreements worth UAH 362.7 billion have been signed, with 72,111 from public sector banks (MoF, 2025). During martial law in Ukraine, 69,691 loans totaling UAH 273.1 billion were issued, with public sector banks granting 51,635 loans worth UAH 137 billion. As of January 20, 2025 the loans were distributed as follows:

- ▶ UAH 32.71 billion for investment;
- ▶ UAH 69.29 billion for working capital;
- ▶ UAH 41.02 billion for agricultural producers;
- ▶ UAH 31.27 billion for agricultural processing;
- ▶ UAH 1.70 billion for energy financing;
- ▶ UAH 57.47 billion for anti-war purposes;
- ▶ UAH 26.17 billion for high war risk zone lending.

The multi-channel integration mechanism demonstrates how coordinated simultaneous supportThis program has become one of the key tools for economic recovery, helping to reduce the financial burden on entrepreneurs and stimulating the development of manufacturing sectors. The program is also an example of successful cooperation between the state, banks and the business sector in the post-war reconstruction. The program demonstrates how strategic government intervention can sustain economic stability during defensive war. These insights contribute significantly to international dialogues regarding the optimal roles of governments in wartime economies and provide benchmarks for developing business support initiatives during crises. accelerates aid delivery and reduces administrative burden compared to traditional sequential bilateral assistance, providing a replicable

template for other post-conflict reconstruction scenarios, especially in regions that require the swift adoption of EU or international standards. The experience in Ukraine illustrates that accelerated regulatory convergence can be achieved without sacrificing institutional quality when there is proper coordination.

Conceptual strategies for shaping the architectonics of Ukraine's banking system in response to destructive challenges

To encapsulate, the architectural framework for the Ukrainian banking system, particularly in the face of adversity, is anchored in three fundamental principles: hierarchical structure, functional integrity, and institutional resilience. These elements serve as the backbone for developing a robust banking system capable of navigating complex economic landscapes. The main approaches are:

1. The Institutional-Functional Approach aims to optimize the structural components of the banking system by considering their functional roles and institutional connections. It emphasizes a clear division of responsibilities between regulators and commercial banks, along with the introduction of effective supervision mechanisms.
2. The Risk-Based Approach focuses on developing a robust system for identifying, assessing, and managing systemic risks. It highlights the importance of establishing counter-cyclical capital buffers and mechanisms for absorbing shocks.
3. The Innovative and Technological Approach concentrates on digitalizing banking processes, implementing open banking practices, and fostering a fintech ecosystem. These efforts are intended to enhance operational efficiency and broaden the spectrum of financial services offered.
4. The Macro-prudential Approach ensures the balanced development of the banking system concerning its influence on macroeconomic stability. Key elements include controlling systemic risks and coordinating monetary and macro-prudential policies.
5. The Forecasting and Strategic Approach emphasizes creating a long-term vision for the banking system's evolution, considering potential changes in the financial landscape. Essential components include developing adaptive strategies for different macroeconomic scenarios, employing forecasting and stress-testing systems, creating mechanisms for early detection of structural issues, designing flexible strategic plans, and integrating environmental, social and governance (ESG) factors into planning.
6. The Resilient Approach focuses on enhancing the banking system's ability to adapt to and recover from various shocks. Key elements include establishing a multi-tiered system of protective measures, developing alternative service channels, diversifying sources of liquidity and capital, implementing flexible operational models, strengthening reserve capacities of critical infrastructure, and creating mechanisms for rapid recovery from crises.
7. The Integration Approach seeks to align the national banking system with

international best practices, including adherence to the requirements of the Basel Committee and EU directives.

These approaches collectively aim to strengthen and modernize Ukraine's banking system in a way that enhances its stability and adaptability in a rapidly changing environment. These approaches provide banks and regulators with a modular toolkit for crisis resilience enhancement, allowing selective implementation based on institutional capacity: Institutional-Functional and Risk-Based approaches for Basel compliance, Innovation-Technology for digital transformation, and Resilient approaches for operational continuity under extraordinary challenges. This flexibility makes the framework applicable across diverse levels of economic development and regulatory maturity.

Discussion

The findings of the study indicate that the architecture of Ukraine's banking system is influenced by a complex interplay of macroeconomic, geopolitical, and technological factors, particularly when faced with destructive challenges. The identified structural changes within the banking sector reflect a significant capacity for adaptation while simultaneously revealing critical issues that merit deeper investigation.

An analysis of the Financial Stress Index dynamics reveals a distinct pattern of banking system response to the full-scale invasion that differs significantly from previous crises. While Arzhevitin et al. (2023) documented the initial shock response of banking institutions under martial law, our findings extend this understanding by identifying a three-phase adaptation model that evolves over a longer timeframe. Unlike the findings of Laeven et al. (2016), who described primarily biphasic crisis response patterns in global banking systems, the Ukrainian banking system demonstrates a more complex adaptation trajectory involving shock absorption, functional adaptation, and structural reconfiguration phases. This raises an important question for the scientific community: Could this three-phase model serve as a theoretical framework for understanding banking system resilience in other prolonged military conflict settings? Moreover, the resilience of the financial system during extended periods of economic instability warrants further examination. An analysis of financial stress indicators indicates that, despite existing liquidity support frameworks, overall capitalization levels are insufficient for extensive lending to the real economy. Exploring alternative financing mechanisms – particularly through capital markets and nonbank financial institutions – emerges as a promising avenue for development.

The relationship between institutional resilience and digital transformation emerges as particularly significant in our results. While Frost et al. (2021) emphasized the general importance of technological innovation in reshaping banking architecture, our findings demonstrate a more specific causal relationship between pre-conflict digital investment and operational resilience during wartime. Banks with higher digital penetration showed markedly better adaptation capabilities, challenging

the conventional understanding of digital transformation as primarily an efficiency driver rather than a resilience factor. This perspective invites further scholarly debate on whether digitalization should be conceptualized as a fundamental component of institutional stability rather than merely an operational enhancement.

Our results concerning the role of international financial organizations (IFOs) in banking system stabilization both align with and diverge from existing research. The question of how to balance international cooperation with sovereign financial resilience remains open for scholarly debate, particularly as Ukraine continues its European integration path while managing war-related financial challenges. Beck (2024) highlighted the importance of regulatory reforms in post-crisis stabilization, but our findings suggest a more nuanced relationship between international standards implementation and local resilience mechanisms. The accelerated implementation of Basel standards in Ukraine during wartime presents an interesting counterpoint to the gradual adoption typically observed in stable economies. This raises important theoretical questions about the optimal pace of regulatory convergence under extreme conditions – should international standards be adapted more flexibly in conflict environments, or does accelerated implementation provide unique benefits?

The banking system's adaptability to macroeconomic volatility is another critical concern. The pronounced fluctuations in financial markets, coupled with inflationary pressures and structural imbalances, call for the exploration of innovative crisis management strategies. The research suggests that formulating predictive scenarios for macroeconomic stabilization could empower banks to alleviate the detrimental effects of external shocks.

The relationship between banking system resilience and broader economic recovery remains an area requiring further investigation. While our analysis indicates that adaptability and institutional flexibility are crucial for enhancing system resilience, it remains unclear whether these qualities translate directly into improved economic outcomes. Meshcheriakov et al. (2023) identified specific adaptation mechanisms during military conflict, but the long-term economic impact of these adaptations requires longitudinal study. We invite other researchers to explore whether the adaptive mechanisms we've identified represent temporary emergency responses or fundamental institutional evolutions with lasting implications.

A fundamental challenge lies in evaluating the efficacy of state regulation of the banking system under conditions of martial law. Proactive governmental interventions, including bank recapitalization efforts, financial support programs, and regulatory accommodations, have proven beneficial to system stability. However, excessive governmental oversight may stifle competitive evolution and inhibit private investment. Therefore, it is essential to optimize the state's role within the banking sector while fostering mechanisms that promote private capital engagement.

These approaches provide banks and regulators with a The findings of this study hold significant practical implications for key institutions within Ukraine's financial and economic system. The National Bank of Ukraine, serving as the central regulatory authority, can leverage these research outcomes to refine monetary policy mechanisms and improve banking supervision frameworks. The Ministry of Finance

of Ukraine will have the opportunity to incorporate the study's recommendations into the processes of fiscal policy formation and coordination with the banking sector. Central executive authorities can utilize scientifically grounded tools for assessing the effectiveness of existing regulatory and legal frameworks, as well as for conceptualizing future legislative initiatives. Entities involved in legislative initiatives can draw upon the research materials as a theoretical and methodological foundation for developing regulatory acts aimed at optimizing the structure of the banking system and bolstering its resilience against systemic shocks. modular toolkit for crisis resilience enhancement, allowing selective implementation based on institutional capacity: Institutional-Functional and Risk-Based approaches for Basel compliance, Innovation-Technology for digital transformation, and Resilient approaches for operational continuity under extraordinary challenges. This flexibility makes the framework applicable across diverse levels of economic development and regulatory maturity.

In summary, the enhancement of Ukraine's banking system requires a comprehensive approach that fuses strategic planning, adaptive regulatory frameworks, and the proactive deployment of innovative financial instruments. Future research should emphasize modeling long-term trajectories for the banking sector, assessing the impact and effectiveness of international financial assistance, and developing mechanisms to ensure financial stability throughout the postwar recovery period.

The implications of our findings extend beyond academic interest to practical policy considerations. We encourage financial regulators, banking professionals, and academic researchers to engage in collaborative dialogue around these findings to develop more resilient banking architectures capable of withstanding extraordinary challenges while supporting the national economy amid global shifts.

Conclusions

This study reveals the profound transformation within Ukraine's banking system, characterized by a dual nature: remarkable adaptability to immediate external shocks coupled with vulnerability to extended crises. The analysis identifies that institutional flexibility, incorporating both formal regulations and informal practices, serves as the foundation for system resilience. Military conflict, financial market volatility, monetary policy misalignments, and accelerated digitalization have fundamentally altered the operational landscape for banking institutions, necessitating new adaptive strategies.

Our examination of the banking system's response to prolonged uncertainty demonstrates that three key elements – institutional agility, structural reconfiguration, and proactive risk management – form the critical foundation for maintaining viability under destructive challenges. The system's capacity for self-organization and innovation becomes particularly evident when confronted with asymmetric threats, enabling adaptation despite severe external pressures.

International financial institutions emerge as essential catalysts in strengthening Ukraine's banking architecture through multiple mechanisms. Beyond providing

crucial financial support, these organizations drive the implementation of improved regulatory standards aligned with EU frameworks. The synergistic relationship between domestic banking institutions and international financial organizations facilitates strategic responses to global challenges, particularly evident in the application of Basel recommendations, corporate governance enhancements, and financial technology modernization.

Strategic development priorities for Ukraine's banking system include regulatory landscape enhancement, intensification of financial support for enterprises, and comprehensive financial infrastructure modernization. The analysis of the "5-7-9%" concessional lending program demonstrates its effectiveness in expanding financial resource access for small and medium enterprises, stimulating broader economic activity even amid wartime conditions.

The conceptual frameworks developed in this study for strategic banking adaptation utilize system analysis, strategic forecasting, and institutional reconfiguration approaches. Grounded in principles of emergence, nonlinearity, and structural dynamics, these frameworks effectively illuminate latent transformation processes and enable the formulation of adaptive scenarios under conditions of extreme uncertainty.

Our findings underscore the necessity of integrating adaptive strategies, digital innovations, and novel financial instruments to enhance the sustainability and competitive position of Ukraine's banking system. Transparency and regulatory compliance prove essential for effective crisis response, while the integration of international banking supervision standards within the national legislative framework strengthens public confidence in banking institutions.

Future research should focus on: (a) developing more sophisticated models for predicting banking system responses to protracted conflicts; (b) investigating the interrelationship between digitalization and institutional resilience through comparative studies across different conflict zones; (c) evaluating the long-term sustainability of accelerated regulatory adaptations for post-war reconstruction planning; and (d) examining the optimal balance between international integration and national financial sovereignty during periods of geopolitical instability.

The scientific novelty of this work lies in developing a comprehensive approach to analyzing banking architecture optimization mechanisms under the simultaneous influence of European integration processes and specific challenges of wartime and post-war periods. The proposed methodology can serve as a theoretical foundation for conducting similar research in countries undergoing structural banking sector reforms and European integration transformations. The research directly correlates with achieving Sustainable Development Goal 17 "Partnerships for Sustainable Development" through optimizing mechanisms for mobilizing additional financial resources for national recovery and modernization. The proposed solutions contribute to creating a favorable regulatory environment for attracting foreign direct investment and developing national capital markets. ■

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