UDC 330.34:338.1:304(477)
JEL: H56; O11; O15; O38
DOI: https://doi.org/10.32983/2222-4459-2026-7-72-83

ECONOMIC SECURITY AND HUMAN DEVELOPMENT OF UKRAINE: A TWO-STAGE MATRIX APPROACH IN THE CONTEXT OF THE SOCIETY 5.0 CONCEPTION

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UDC 330.34:338.1:304(477)
JEL: H56; O11; O15; O38

Ivanova N. S., Yankovskyi V. A. Economic Security and Human Development of Ukraine: A Two-Stage Matrix Approach in the Context of the Society 5.0 Conception

The article attempts to explore the relationship between economic security and human development in Ukraine within the framework of the Society 5.0 conception. The relevance of the study comes from the contradiction between the need to maintain the country's economic stability and preserving human potential during the ongoing full-scale war. Despite a significant number of scientific works in these areas, these categories are mostly analyzed separately, which limits the ability to comprehensively assess socioeconomic transformations and form balanced managerial decisions. The aim of the study is to build and test a two-stage matrix of «economic security – human development» and to create managerial implementations based on it in the context of the Society 5.0 conception. Methods of comparative, graphical, index, and matrix analysis were used based on data on the Human Development Index (HDI) and the integrated economic security indicator of Ukraine for 2012–2025. In the first stage, a normative matrix was built with threshold values of HDI = 0.700 and ESI = 50 points. In the second stage, an adapted matrix based on the average values of the indicators was created, which allows assessing the country's position relative to its own development trajectory. The results showed that from 2012 to 2025, Ukraine consistently remained in the quadrant of relatively high human development but with an insufficient level of economic security. The adapted matrix revealed internal dynamics: a shift from a favorable combination of both indicators in 2012–2018 to a situation where both indicators were below their own averages in 2024–2025. The phenomenon of structural asymmetry was determined: in 2025, the HDI recovered to its pre-war level, while the economic security index continued to decline, which is interpreted as a structural imbalance, where social stability is maintained by the inertia of inherited systems and external support rather than by strengthening its own economic foundation. The scientific novelty lies in the development and testing of a two-stage matrix approach that combines normative assessment with the analysis of the system's internal dynamics. The practical value of the results lies in the ability to use the tools for monitoring balanced development and creating management implementations focused on a human-centered model of postwar recovery in Ukraine, according to the principles of Society 5.0.

Keywords: *economic security; national security; human development; matrix analysis; Society 5.0; human-centred economy.*
Fig.: *4.* ***Tabl.:*** *2.* ***Bibl.:*** *25.*

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УДК 330.34:338.1:304(477)
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Іванова Н. С., Янковський В. А. Економічна безпека та людський розвиток України: двоетапний матричний підхід у контексті концепції Society 5.0

У статті здійснено спробу дослідити взаємозв'язок економічної безпеки та людського розвитку України в контексті концепції Society 5.0. Актуальність дослідження зумовлена суперечністю між необхідністю підтримання економічної стійкості держави та збереженням людського потенціалу в умовах повномасштабної війни. Попри значну кількість наукових праць у цих сферах, зазначені категорії переважно аналізуються відокремлено, що обмежує можливості комплексного оцінювання соціально-економічних трансформацій і формування збалансованих управлінських рішень. Метою дослідження є побудова й апробація двоетапної матриці «економічна безпека – людський розвиток» і формування на її основі управлінських імплементацій у контексті концепції Society 5.0. Застосовано методи порівняльного, графічного, індексного та матричного аналізу на основі даних щодо індексу людського розвитку (HDI) та інтегрального показника економічної безпеки України за 2012–2025 рр. На першому етапі побудовано нормативну матрицю з пороговими значеннями HDI = 0,700 та ІЕБ = 50 балів. На другому – адаптовану матрицю на основі середніх значень показників, що дозволяє оцінювати позицію країни відносно власної траєкторії розвитку. Результати засвідчили, що протягом 2012–2025 рр. Україна незмінно перебувала у квадранті відносно високого людського розвитку за недостатнього рівня економічної безпеки. Адаптована матриця виявила внутрішню динаміку: зміщення від сприятливого поєднання обох показників у 2012–2018 рр. до ситуації, коли обидва показники нижче власних середніх значень у 2024–2025 рр. Установлено феномен структурної асиметрії: у 2025 році HDI відновився до довоєнного рівня, тоді як індекс економічної безпеки продовжив знижуватися, що інтерпретується як структурний дисбаланс, за якого соціальна стійкість підтримується інерцією успадкованих систем і зовнішньою підтримкою, а не зміцненням власного економічного фундаменту. Наукова новизна полягає в розробці та апробації двоетапного матричного підходу, що поєднує нормативну оцінку з аналізом внутрішньої динаміки системи. Практична цінність результатів – у можливості використання інструментарію для моніторингу збалансованості розвитку та формування управлінських імплементацій, орієнтованих на людиноцентричну модель повоєнного відновлення України відповідно до принципів Society 5.0.

Ключові слова: *економічна безпека; національна безпека; людський розвиток; матричний аналіз; Society 5.0; людиноцентрична економіка.*
Рис.: *4.* ***Табл.:*** *2.* ***Бібл.:*** *25.*

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Russia's full-scale invasion has confronted Ukraine with an unprecedented challenge in its modern history: maintaining the country's economic resilience while preserving the human capital upon which any successful post-war recovery ultimately depends. These two objectives are often perceived as competing objectives. On the one hand, governments face increasing pressure to pursue fiscal consolidation and expenditure restraint; on the other, sustaining investment in education, healthcare, and household welfare remains essential. However, the Society 5.0 concept challenges the validity of this trade-off. It views economic security and human development not as competing policy objectives but as complementary and mutually reinforcing conditions for sustainable social progress.

Despite the conceptual appeal of this proposition, its empirical verification in Ukraine remains limited. Most existing studies examine economic security and human development as separate analytical constructs, employing distinct indicators and methodological frameworks to explore their relationships. Consequently, there is not only a lack of an integrated analytical framework but also an inability to address an important practical question: do economic security and human development evolve synchronously, or can their trajectories diverge? If so, what are the implications for public policy and strategic decision making?

This study addresses this research gap by developing and empirically testing an analytical framework capable of assessing not only the individual status of economic security and human development but also the dynamics of their interaction under the systemic challenges associated with war. By proposing a two-stage matrix approach, this study provides a means of identifying structural imbalances that remain obscured when these dimensions are analysed independently, thereby contributing to the evidence base for human-centred policymaking within the framework of Society 5.0.

LITERATURE REVIEW

The issue of ensuring economic security and its relationship with human development has attracted considerable scholarly attention, particularly in the context of global crises and digitalisation. Economic security is regarded as a latent foundation of societal well-being, the importance of which increases substantially during periods of systemic shocks [1]. It is commonly defined as a state of protection of national interests that safeguards state sovereignty, ensures stability, and creates favourable conditions for progressive socioeconomic development [2–4].

The conceptual foundations of human security and its seven dimensions (economic, food, health, environmental, personal, community, and political security) were established in the reports of the United Nations Development Programme (UNDP). Contemporary scholars, including P. Koundouri and K. Dellis [5], emphasise the need to integrate these dimensions into sustainable development strategies and the United Nations Sustainable Development Goals (SDGs). M. Somych et al. [6] significantly contributed to understanding the interdependence between socioeconomic status and economic security through the lens of international indices such as the Human Development Index (HDI) and the Social Progress Index.

The Society 5.0 concept, introduced by the Government of Japan, proposes a new human-centred development paradigm in which digital technologies, including artificial intelligence (AI), the Internet of Things (IoT), and Big Data, are employed not only to stimulate economic growth but also to address social challenges and improve the quality of life [7–9]. V. A. Yankovskyi et al. [10] argue that Society 5.0 facilitates the transformation of the economy from a resource-dependent model to an innovation-driven one, where human capital becomes the principal strategic resource. O. Stryzhak [11] further notes that the level of human capital development is closely associated with countries' digital readiness, although this relationship varies across different national contexts.

Within the Ukrainian scholarly discourse, issues of economic security under wartime conditions and post-crisis recovery have been extensively examined by experts at the National Institute for Strategic Studies (NISS). Their research substantiates a paradigm for modernising the national security strategy based on the principles of resilience and sustainable develop-

ment [12; 13]. N. Kalyuzhna, A. Khodzhaian, and I. Baron [14] and other researchers highlight the destructive effects of exogenous factors, including globalisation and military-political threats, on Ukraine's economic security and propose methodologies for calculating integrated economic security indicators for Ukraine.

Matrix-based and mathematical modelling approaches to security processes were explored by O. Kovalchuk et al. [15], who applied multivariate statistical analysis to identify the determinants that influence national security. The regional dimension of human security in Ukraine has also been investigated by N. Biloshkurska et al. [16] through the development of composite indices and analytical matrices linking economic security, QoL and innovative development.

Despite the substantial body of existing research, there remains a need for a more comprehensive investigation of the synergistic relationship between economic security and human development using a two-stage matrix-based approach within the framework of transitioning to Society 5.0. Such an approach would enable a more precise identification of strategic priorities for public policy aimed at strengthening national resilience and promoting sustainable and human-centred development.

RESEARCH AIM AND QUESTIONS

This study aims to explore the relationship between Ukraine's Economic Security and human development by developing and testing a two-stage Economic Security–Human Development Matrix to formulate managerial implications within the framework of the Society 5.0 concept.

RESEARCH METHODS

To achieve the research aim, a combination of general scientific and specialised methods of economic analysis was employed. The analysis and synthesis method was used to systematise theoretical approaches to economic security and human development. The comparative method enabled the examination of the temporal dynamics of these two indicators. A graphical method was applied to visualise the indicator trends and construct coordinate matrices. An index-based approach was adopted to utilise established composite indices: the Human Development Index (HDI) and the International Liberty Institute (ILI) Economic Security Index, as measures of the phenomena under investigation. Finally, matrix analysis was employed to classify the states of the national economy within the coordinate framework of economic security and human development.

The empirical basis of the study comprises data from the United Nations Development Programme (UNDP) on Ukraine's Human Development Index (HDI) for 1990–2023 [17–19], data from the Ministry of Economy of Ukraine on the integrated Economic Security Index for 2012–2022 [20], and data from the International Liberty Institute (ILI) on the Economic Security Index for 2024–2025 [21; 22]. To provide a broader contextual interpretation of the findings, the analysis also incorporates selected macroeconomic indicators from the World Bank [23], the UNDP Ukraine Human Development Report [24], and materials from the Ukraine War Economy Tracker developed by the Centre for Economic Strategy [25].

The methodological framework is based on a two-stage matrix approach designed to analyse the relationship between economic security and human development (*Tbl. 1*).

Unlike conventional matrix analysis, the proposed methodology employs two complementary matrices sequentially. The normative matrix assesses the position of the study object against externally defined development and security benchmarks, whereas the adapted matrix examines the system's internal dynamics using the average values of the indicators as the endogenous threshold values. The integration of these two analytical stages provides a more comprehensive basis for formulating evidence-based managerial implications to support a human-centred development model within the Society 5.0 framework.

RESEARCH RESULTS

The analysis of empirical data covering the period 2012–2025 makes it possible to distinguish three qualitatively distinct stages in the dynamics of the indicators under investigation.

The first stage (2012–2022) is characterised by the relative stability of both indicators. The Human Development Index (HDI) fluctuated within a narrow range of 0.772–0.789, indicating gradual, albeit uneven, improvements in human capital despite the events of 2014 (*Fig. 1*).

The Economic Security Index (ESI), calculated according to the methodology of the Ministry of Economy of Ukraine, ranged between 41 and 49 points, exhibiting a slight downward trend. This suggests that the Ukrainian economy operated under conditions of moderate but persistent vulnerability without experiencing catastrophic fluctuations during this period (*Fig. 2*).

The second stage (2023) is methodologically non-comparable because data on the integrated Economic Security Index are unavailable owing to the transition from the methodology of the Ministry of Economy of Ukraine to that of the International Liberty Institute (ILI) Economic Security Index. Consequently, this year cannot be reliably incorporated into the comparative analysis. Nevertheless, the HDI value for 2023 (0.779) remains within the previously observed stable range.

Table 1

Algorithm for constructing the two-stage Economic Security – Human Development Matrix

Stage	Description	Output
1. Data compilation	Compilation of time-series data on the Human Development Index (HDI) and Economic Security Index (ESI) for the selected study period. Verification of data completeness and identification of missing observations	Dataset for constructing the matrices
2. Construction of the normative matrix	Development of the Economic Security – Human Development Index (ESI-HDI) coordinate framework. Establishment of normative threshold values in accordance with international and national assessment methodologies. Each annual observation was plotted within the coordinate framework, and its corresponding quadrant was determined	Normative assessment of the study object relative to established economic security and human development benchmarks
3. Construction of the adapted matrix	Calculation of the average HDI and ESI values for the entire study period. These averages were used as endogenous threshold values to define the coordinates framework. All observations were repositioned relative to the historical average state of the system	Identification of internal development dynamics and the trajectory of change over time
4. Comparative analysis of the results	Comparison of the results obtained from the normative and adapted matrices. Examination of similarities and differences between static (benchmark-based) and dynamic (historical) assessments of system development	Identification of structural development patterns and changes in the position of the study object
5. Formulation of managerial implications	The matrix analysis results were interpreted, and recommendations were developed to strengthen economic security, enhance human development, and improve the balance between the two dimensions	The managerial implications for public policy are consistent with the objectives of Society 5.0

Source: compiled by the authors.

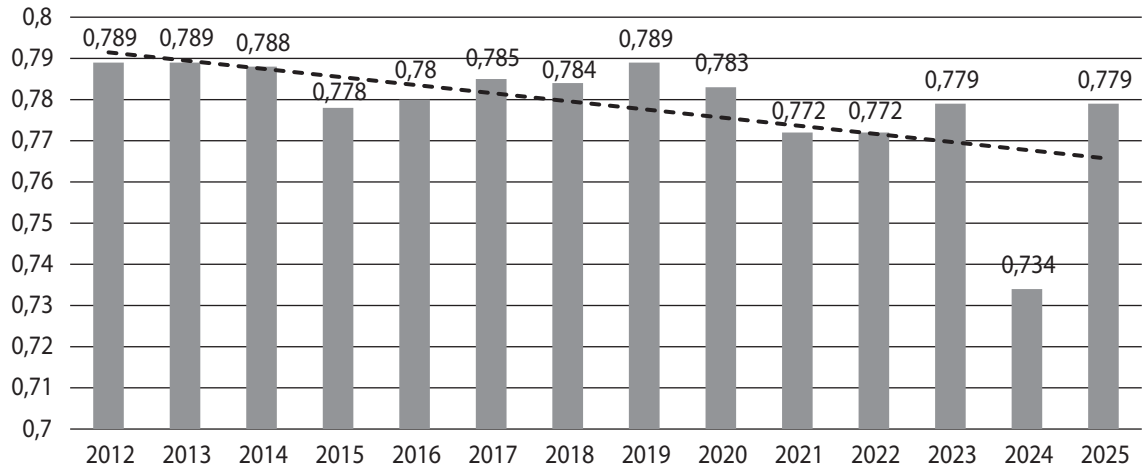

Fig. 1. Dynamics of Ukraine's Human Development Index (HDI), 2012–2025

Source: compiled by the authors based on [17–19].

The third stage (2024–2025) reveals a pronounced structural shift. In 2024, the HDI declined to 0.734, the lowest value recorded during the study period, and the Economic Security Index fell to 35.2 points. In 2025, the HDI recovered to 0.779, almost returning to its pre-war level, whereas the Economic Security Index continued to deteriorate, declining further to 33.4 points.

Overall, the findings indicate that throughout 2012–2025, Ukraine maintained a relatively high level of human development, whereas economic security remained considerably weaker and exhibited greater volatility. The most substantial deterioration in both indicators occurred after the outbreak of the full-scale war.

This study has some methodological limitations. The Economic Security Index values for 2012–2022

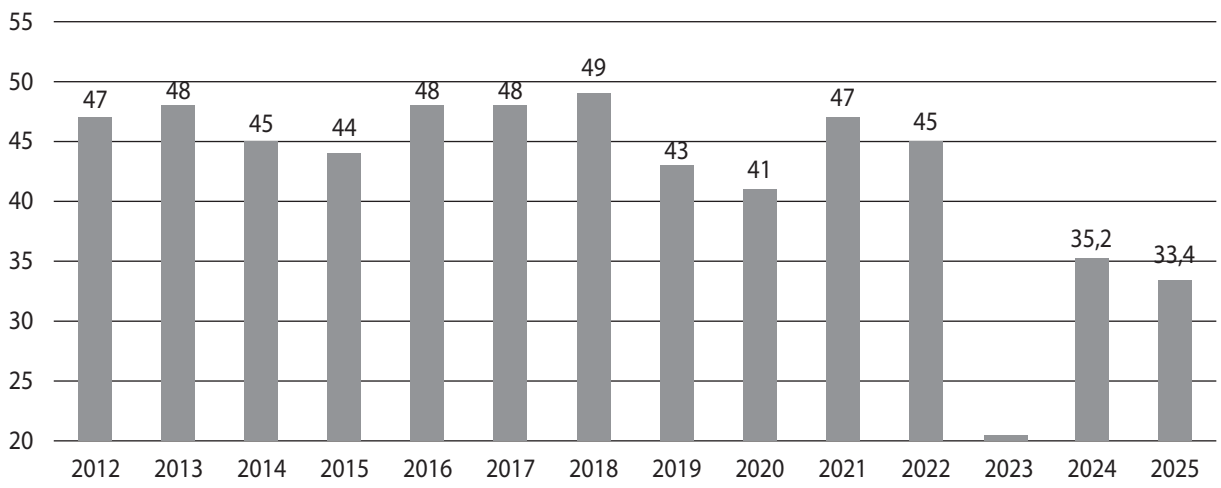

Fig. 2. Dynamics of Ukraine's Economic Security Index, 2012–2025 (data for 2023 are unavailable)

Source: compiled by the authors based on [20] (2012–2022) and [21; 22] (2024–2025).

and 2024–2025 were calculated using different methodologies, which complicates direct numerical comparisons of their absolute values across these periods. Nevertheless, the overall direction and magnitude of the observed changes were sufficiently pronounced to support the subsequent analytical interpretation.

A more detailed examination of the component structure of the ILI Economic Security Index for 2024–2025 identifies the dimensions responsible for critically low overall scores. The weakest performance was observed in the fiscal and financial domain [21; 22], including taxation and public finance (14 points), money and finance (16.5 points), macroeconomic stability (19.9 points), and infrastructure (22.1 points). Disaggregated macroeconomic indicators further support this finding. Military expenditure is expected to reach 36.53% of GDP in 2024 and 34.48% in 2025. Central government debt is estimated to be 58.7% of GDP in 2024, whereas total government expenditure accounts for 65.56% of GDP. The balance of trade in goods and services remained consistently negative (–20.9% of GDP in 2024 and –18.9% in 2025), and unemployment remained elevated at 9.48% in 2024 and 9.83% in 2025 [23–25].

The institutional dimension of vulnerability is particularly noteworthy. Ukraine ranks 104th globally in the Corruption Perceptions Index, with a score of 36 out of 100, while the protection of property rights is assessed at only 3.98 out of 10. Furthermore, foreign direct investment (FDI) per capita amounted to only USD 1.430 in 2023, which is substantially below the indicative benchmark of over USD 20.000 [23].

A distinctive methodological feature of the ILI Economic Security Index employed in this study is that its human-centred orientation is embedded not as an external theoretical construct but as a fundamental philosophical principle underlying the methodology itself. Unlike traditional approaches to economic security, which primarily focus on the state and its institutions, the ILI methodology conceptualises economic security as the condition of an individual throughout the entire life cycle: from birth and upbringing, through education and employment, to consumption, savings, and support during periods of economic hardship [21; 22].

Accordingly, the empirically observed decline in the Economic Security Index should not be interpreted as a mere deterioration in macroeconomic indicators. Rather, it reflects a contraction of the economic freedom and security available to the individuals. Consequently, although based on different methodological frameworks, both indices employed in this study are inherently human-centred, thereby strengthening the methodological compatibility of the proposed two-dimensional analytical framework and reinforcing its consistency with the principles of Society 5.0.

Following the proposed research algorithm, the first stage involved constructing a normative two-dimensional Economic Security-Human Development Matrix based on threshold values established by international and national assessment methodologies. For the Human Development Index, a threshold value of 0.700 was adopted in accordance with the United Nations Development Programme (UNDP) classification, under which values exceeding 0.700 indicate a high level of human development. For the Economic Security Index, a threshold value of 50 points was applied following the methodology of the International Liberty Institute, where this value separates a vulner-

able economic condition from a satisfactory level of economic security. Therefore, the normative matrix provides a benchmark for evaluating Ukraine's position relative to internationally recognised standards of economic security and human development.

The results show that all observations for Ukraine during 2012–2025 are located within the same quadrant, namely, the quadrant representing high human development combined with weak economic security (HDI > 0.700 and ESI < 50) (*Fig. 3*).

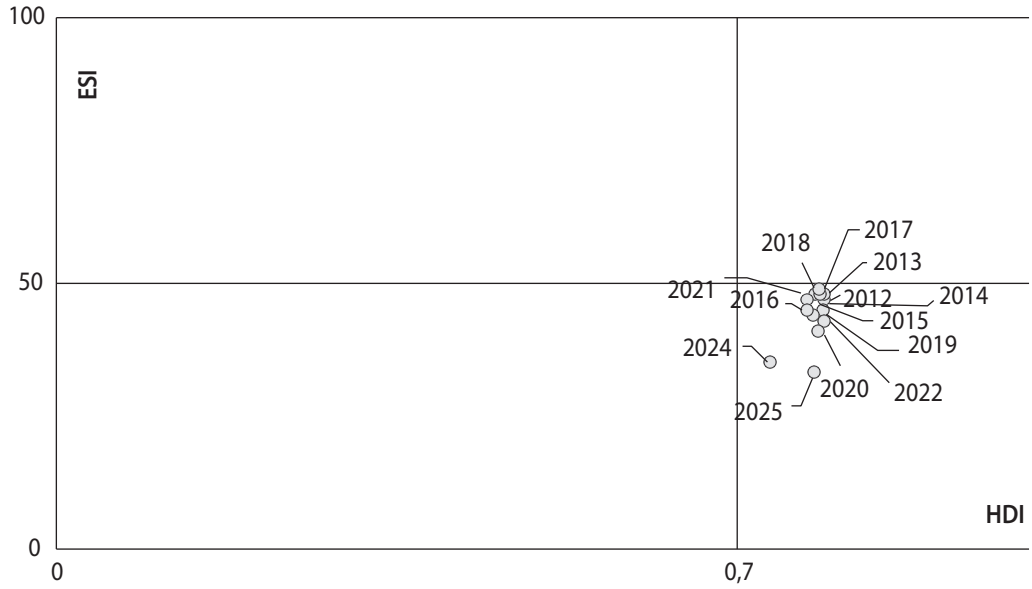

Fig. 3. Ukraine's Economic Security – Human Development (ESI-HDI) Matrix Based on Normative Threshold Values, 2012–2022 and 2024–2025

Source: compiled by the authors.

The normative matrix demonstrates that throughout the study period, Ukraine remained in the quadrant characterised by high human development and insufficient economic security. This finding indicates a persistent imbalance between human capital development and the economic system's capacity to ensure an adequate degree of resilience to internal and external threats to the economy.

The analysis further reveals that, despite variations in the values of the two indicators and the methodological change in measuring economic security for the later years of the study period, none of the observations shifted to another quadrant in the matrix. This consistency suggests a relatively stable development pattern characterised by the coexistence of high human development and persistently inadequate economic security.

Simultaneously, the application of normative threshold values proved insufficient for examining the internal dynamics of Ukraine's development, as all observations were concentrated within a single quadrant. Under these conditions, the normative matrix provides an effective diagnostic tool for assessing the overall state of the system but cannot capture changes in a country's relative position within the two-dimensional analytical space. Therefore, the second stage of the analysis employed an adapted matrix based on the average values of the HDI and Economic Security Index over the entire observation period.

Given the limitations of the normative approach, an adapted matrix was constructed using the average values of the Human Development Index and Economic Security Index as coordinate axes. This approach is widely applied in strategic analysis to identify relative shifts in the positions of the objects under investigation and enables the assessment of a country's development trajectory in relation to its own historical average. The mean HDI value for 2012–2025 is 0.780, while the corresponding mean Economic Security Index value is 44 points (*Fig. 4*).

Unlike the normative matrix, the adapted approach reveals the internal dynamics of Ukraine's development:

- **2012–2018:** Ukraine was predominantly located in the quadrant where both indicators exceeded their historical averages, representing a period characterised by a relatively favourable combination of human development and economic security.
- **2019–2020:** The country's position shifted towards the quadrant combining above-average human development with below-average eco-

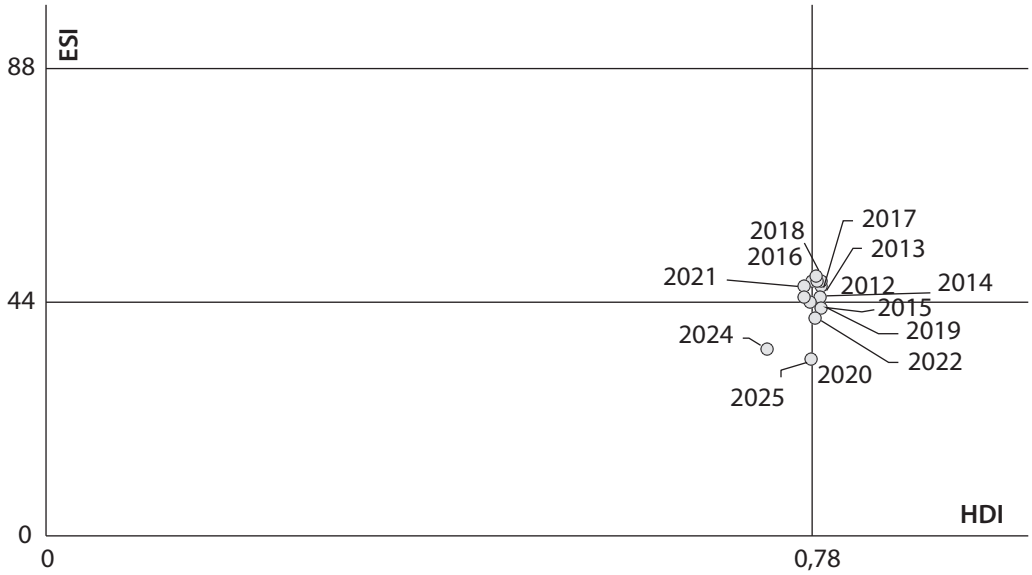

Fig. 4. Ukraine's Economic Security – Human Development (ESI-HDI) Matrix Based on Average Values, 2012–2022 and 2024–2025

Source: compiled by the authors.

nomic security, indicating the intensification of economic vulnerability.

- **2021–2022:** Further deterioration in human development was observed, whereas economic security remained close to its historical average.
- **2024–2025:** Ukraine moved into the quadrant where both indicators fell below their historical average values, reflecting the combined impact of wartime challenges on the economic and social dimensions of national development.

The proposed two-stage analytical framework combines a normative assessment of development with an evaluation of its internal dynamics, thereby providing a more robust basis for deriving managerial implications within the human-centred development paradigm of Society 5.0 (*Tbl. 2*).

A comparison of the normative and adapted matrices provides a basis for developing managerial implications that differ according to the planning horizons.

In the short term, public policy should prioritise maintaining macro-financial stability, ensuring fiscal sustainability, and preserving critical social programmes, particularly those that sustain the level of human development within the high-HDI quadrant identified by the normative matrix. This implies that fiscal consolidation should not be pursued at the expense of expenditure on education, healthcare, and household incomes, as these components have been instrumental in preserving Ukraine's relatively high level of human development despite the prolonged economic insecurity.

From a medium-term perspective, priority should be given to institutional reforms, the development of digital infrastructure, the modernisation of public administration, and the creation of conditions conducive to retaining and attracting human capital. The trajectory identified by the adapted matrix, which shows Ukraine's movement towards the quadrant where both indicators are below their historical averages (2024–2025), signals the need for targeted policy measures capable of simultaneously strengthening the fiscal-budgetary and monetary-financial dimensions of economic security, the weakest components identified by the ILI component analysis, while facilitating a return to the favourable development quadrant observed during 2012–2018.

The findings of the two-stage matrix analysis require further interpretation in the context of existing theoretical approaches and the methodological features of the proposed analytical framework.

DISCUSSION

The findings of this study should be interpreted in the context of the existing theoretical perspectives and methodological characteristics of the proposed analytical approach.

First, Ukraine's persistent position within the quadrant representing high human development and insufficient economic security throughout 2012–2025 is not unique among transition economies. This pattern is characteristic of countries where inherited healthcare and education systems continue to sustain relatively high HDI values despite the absence of a sufficiently robust fiscal or institutional foundation for their

Table 2

Comparison of the Normative and Adapted Economic Security – Human Development Matrices

Criterion	Normative Matrix	Adapted Matrix
Threshold values	HDI = 0.700; ESI = 50 points (international and national benchmarks)	HDI = 0.780; ESI = 44 points (period averages for 2012–2025)
Type of assessment	Absolute assessment relative to external benchmark values	Relative assessment based on the country's historical trajectory
Results for Ukraine	A single quadrant throughout the entire study period (2012–2025)	Four consecutive quadrants: 2012–2018; 2019–2020; 2021–2022; 2024–2025
Analytical function	Diagnosis of the overall state of the system relative to normative benchmarks	Identification of internal dynamics and the country's development trajectory

Source: compiled by the authors.

funding. This observation is consistent with the argument advanced by O. Mints and A. Tolkachiova-Mints [1], who conceptualise economic security as a latent foundation of well-being, the significance of which becomes particularly evident during periods of systemic shocks rather than under conditions of relative stability. In other words, a comparatively high level of human development may conceal structural vulnerabilities within the economic system for an extended period. The normative matrix clearly illustrates this phenomenon, as all observations over the fourteen-year period remain concentrated within a single quadrant.

However, limiting the interpretation to this conclusion would underestimate the analytical value of the proposed methodology. The adapted matrix, which employs the historical average values of the indicators as endogenous threshold values, reveals patterns that are hidden in the normative assessment. Specifically, it identifies four successive states of Ukraine's socioeconomic system, reflecting a clear deterioration in the country's relative position – from the favourable combination of above-average human development and economic security during 2012–2018 to the quadrant in which both indicators fall below their historical averages in 2024–2025. These findings are consistent with the approach proposed by M. Somych et al. [6], who emphasised that economic security should be analysed not only in absolute terms but also from a relative perspective, using both international and domestic benchmarks. However, the proposed matrix-based methodology extends this approach by replacing the external benchmarks in the second stage with an endogenous reference point derived from the country's own historical trajectory. Such an approach is particularly appropriate for economies undergoing profound structural transformations, where externally defined threshold values may fail to capture the country-specific development patterns.

A particularly significant finding is the phenomenon of "decoupled recovery" observed in 2025. While the Human Development Index recovered to almost its pre-war level (0.779), the Economic Security Index continued to decline (33.4). This phenomenon cannot be adequately explained by conventional quantitative comparisons. Rather, it may be interpreted as evidence of a structural asymmetry between social resilience, which largely depends on the inertia of long-established education and healthcare systems together with substantial international support, and economic security, which responds more rapidly and sensitively to changes in the fiscal and financial environments. This interpretation is consistent with the principles of Society 5.0 [7–9], according to which human development and economic security constitute complementary rather than automatically synchronised systems. Consequently, a prolonged divergence between their trajectories should be regarded as an indication of structural imbalance rather than equilibrium.

Particular attention should also be paid to the methodological implications of combining data derived from two different methodologies: the Ministry of Economy of Ukraine for 2012–2022 and the International Liberty Institute (ILI) methodology for 2024–2025. Although this represents an acknowledged limitation of the study, the qualitative consistency of the observed patterns was sufficiently robust to support our main conclusions. Specifically, both the persistent position within the normative quadrant and the systematic movement across the quadrants of the adapted matrix are pronounced enough to remain unaffected by the methodological discontinuity between the two data sources. A similar distinction between methodological artefacts and genuine structural changes has been emphasised by N. Kaliuzhna et al. [14] and O. Kovalchuk et al. [15], who argue that qualitative interpretations may remain valid despite the quantitative limitations.

Finally, the proposed analytical framework differs substantially from related methodological approaches. Unlike taxonomic analysis, which requires a set of comparable objects to construct a reference vector, the proposed two-dimensional matrix is designed as a single-object analytical tool, enabling the analysis of a country's development trajectory over time without relying on comparative cross-country samples. Simultaneously, unlike conventional dynamic index analysis, the matrix preserves the two-dimensional relationship between economic security and human development. Therefore, it captures not only the individual level of each indicator but also the nature of their interactions in each observation period. This feature substantially enhances the practical applicability of the proposed methodology for strategic monitoring, evidence-based policymaking, and decision support within the framework of the human-centred development paradigm embodied in Society 5.0.

From a broader methodological perspective, the proposed two-stage matrix approach demonstrates that combining normative benchmarking with trajectory-based assessment provides a more comprehensive understanding of the interaction between economic security and human development than either approach applied independently. This combination expands the analytical toolkit available for evaluating long-term socioeconomic resilience and may be adapted to analyse other countries experiencing significant structural transformations.

CONCLUSIONS

This study provides a comprehensive analysis of the relationship between economic security and human development in Ukraine within the Society 5.0 framework.

To achieve the research aim, a two-stage matrix approach was developed and applied to the data. The first stage involved constructing a normative matrix based on internationally recognised threshold values for the Human Development Index (HDI) and the Economic Security Index (ESI). The results indicate that throughout 2012–2025, Ukraine consistently remained within the quadrant characterised by high human development and insufficient economic security.

To obtain a deeper understanding of the country's internal development dynamics, an adapted matrix was constructed using the historical average values of the two indicators as the endogenous threshold values. This approach made it possible to distinguish successive stages in the transformation of Ukraine's socioeconomic system and trace its gradual movement from a relatively favourable combination of economic security and human development to a situation in which both indicators fell below their historical averages.

The discussion of the findings in the context of existing theoretical approaches identified a structural asymmetry between social resilience and economic security. In 2025, the Human Development Index recovered to almost its pre-war level, whereas the Economic Security Index continued to decline. This divergence should not be interpreted as evidence of equilibrium but rather as an indication of structural imbalance, whereby social resilience is sustained primarily by the inertia of inherited social institutions and extensive external support rather than by strengthening the domestic economic foundations of the country.

The scientific contribution of this study lies in the development and empirical validation of a two-stage matrix methodology that combines normative benchmarking with an endogenous trajectory-based assessment. By integrating these complementary analytical perspectives, the proposed framework enables the identification of structural imbalances that remain undetected when conventional threshold-based assessments are used independently.

The practical significance of the proposed approach lies in its applicability as a strategic analytical tool for monitoring the balance between economic security and human development and supporting evidence-based policymaking within the framework of Ukraine's human-centred post-war recovery, consistent with the principles of Society 5.0.

This study had several limitations that should be considered. *First*, the Economic Security Index for different periods was calculated using two distinct methodological approaches, which restrict direct numerical comparability across the entire observation period. *Second*, the absence of data for 2023 creates a discontinuity in the time series. *Therefore*, future research should focus on developing a three-dimensional assessment model that integrates economic security, human development, and digital transformation indicators. Such a framework could incorporate measures of network readiness, digital economy development, or digital competitiveness, thereby providing a more comprehensive assessment of Ukraine's progress towards implementing the Society 5.0 paradigm. ■

BIBLIOGRAPHY

1. Mints O., Tolkachiova-Mints A. Analysis of the role of economic security among factors of well-being during global crises. *Public Security and Public Order*. 2025. Vol. 37. No. 2. P. 232–234. DOI: https://doi.org/10.13165/PSPO-25-37-02-04
2. Menshikov V., Volkova O., Stukalo N., Simakhova A. Social economy as a tool for ensuring national security. *Journal of Security and Sustainability Issues*. 2017. Vol. 7. Iss. 2. P. 211–231. DOI: https://doi.org/10.9770/jssi.2017.7.2(4)

3. Nikitin A., Vdovychenko O., Beschastnyy V. The role of law enforcement agencies in ensuring national and economic security of Ukraine. *Baltic Journal of Economic Studies*. 2022. Vol. 8. Iss. 4. P. 110–116. DOI: https://doi.org/10.30525/2256-0742/2022-8-4-110-116
4. Koba O. System of economic security and levels of its formation. *Economics of Development*. 2021. Vol. 20. No. 3. P. 40–47. DOI: https://doi.org/10.57111/econ.20(3).2021.40-47
5. Koundouri P., Dellis K. Human security: Concepts and measurement. *Cadmus*. 2023. Vol. 5. Iss. 1. P. 28–44. URL: https://www.cadmusjournal.org/node/975
6. Somych M., Opaliuk T., Potapiuk I. et al. Economic security of Ukraine: Management aspect through the prism of socio-economic development in the context of international ratings. *Politics & Policy*. 2022. Vol. 50. Iss. 4. P. 810–833. DOI: https://doi.org/10.1111/polp.12481
7. Onday O. Japan's Society 5.0: Going beyond Industry 4.0. *Business and Economics Journal*. 2019. Vol. 10. Iss. 2. Art. 389. DOI: https://doi.org/10.4172/2151-6219.1000389
8. Hitachi-U Tokyo Laboratory. Society 5.0: A people-centric super-smart society. *Springer*. 2020. DOI: https://doi.org/10.1007/978-981-15-2989-4
9. Fukuyama M. Society 5.0: Aiming for a New Human-centered Society. *Japan Spotlight*. 2018. Vol. 27. P. 47–50. URL: https://www.hitachihyoron.com/rev/archive/2017/r2017_06/pdf/p08-13_TRENDS.pdf
10. Янковський В. А., Тишко О. Ю., Фоміна О. О., Карлін М. І. Національні інтереси в контексті формування «Society 5.0». *Наукові праці ДонНТУ. Серія економічна*. 2025. № 1. С. 4–11. DOI: https://doi.org/10.31474/1680-0044-2025-1(31)-4-11
11. Стрижак О. Особливості взаємозв'язку рівня розвитку людського капіталу й цифрових технологій у контексті формування суспільства 5.0. *Agricultural and Resource Economics*. 2022. Vol. 8. No. 3. P. 224–243. DOI: https://doi.org/10.51599/are.2022.08.03.11
12. Економічна безпека України в умовах високих воєнних ризиків та глобальної нестабільності : експ.-аналіт. доп. / Базилюк Я., Власенко Р., Власюк О. та ін. ; за заг. ред. Я. Жаліла. Київ : НІСД, 2025. 104 с. DOI:https://doi.org/10.53679/NISS-analytrep.2025.03
13. Економічна безпека України у новій глобальній архітектурі ризиків : експ.-аналіт. доп. / Базилюк Я., Жаліло Я., Шемаєва Л., Собкевич О. та ін. ; за заг. ред. Я. Жаліла. Київ : НІСД, 2026. 136 с. DOI:https://doi.org/10.53679/NISS-analytrep.2026.03
14. Kalyuzhna N., Khodzhaian A., Baron I. Economic seєcurity of Ukraine under the destructive influence of exogenous determinants. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*. 2023. No. 2. P. 161–170. DOI: https://doi.org/10.33271/nvngu/2023-2/161
15. Kovalchuk O., Berezka K., Masonkova M., Chudyk N. et al. Statistical modeling of determinants influencing economic security in the context of sustainable development and national security. *Proceedings of International Conference on Applied Innovation in IT*. 2024. Vol. 12. Iss. 1. P. 197–203. DOI: https://doi.org/10.25673/115700
16. Biloshkurska N., Omelyanenko V., Yemets O. et al. Comprehensive human security assessment in sustainable regional development: Insights for innovation policy. *European Journal of Sustainable Development Research*. 2025. Vol. 9. Iss. 4. Art. em0315. DOI: https://doi.org/10.29333/ejosdr/16572
17. UNDP. *Human Development Report: Ukraine statistical data 1990-2023*. New York, 2024. URL: https://hdr.undp.org
18. UNDP. *The 2023/2024 Human Development Report: Breaking the gridlock – Reimagining cooperation in a polarized world*. New York, 2024. URL: https://hdr.undp.org/content/human-development-report-2023-24
19. UNDP. *Human Development Report 2025*. New York, 2025. URL: https://hdr.undp.org/content/human-development-report-2025
20. Міністерство економіки України. Офіційна відповідь на запит № 3І-952-23 від 04.10.2023 щодо надання публічної інформації про економічну безпеку України за період 2010–2022 років. Київ, 2023. URL: https://dostup.org.ua/request/pokazniki_iekonomichnoyi_biezpie_5
21. International Liberty Institute. *Індекс економічної безпеки України 2024*. Київ, 2025. URL: https://www.ilibertyinstitute.org/index/ekonomichna-bezpeka
22. International Liberty Institute. *Індекс економічної безпеки України 2025*. Київ, 2026. URL: https://www.ilibertyinstitute.org/index/ekonomichna-bezpeka
23. World Bank. (n. d.). *World Development Indicators*. Washington, DC. URL: https://databank.worldbank.org/source/world-development-indicators
24. Річний звіт ПРООН в Україні за 2025 рік. Стійке відновлення та інклюзивний розвиток. *UNDP Ukraine*. 2026. URL: https://www.undp.org/uk/ukraine/publications/richnyy-zvit-proon-v-ukrayini-za-2025-rik-stiyke-vidnovlennya-ta-inklyuzyvnyy-rozvytok
25. Самойлюк М. Трекер економіки України під час війни. *Центр економічної стратегії*. URL: https://ces.org.ua/tracker-economy-during-the-war/

REFERENCES

Bazyliuk Ya., Vlasenko R., Vlasiuk O. & et al. (2025). *Ekonomichna bezpeka Ukrainy v umovakh vysokykh voiennykh ryzykiv ta hlobalnoi nestabilnosti:* eksp.-analit. dop. [Economic security of Ukraine in conditions of high military risks and global instability: expert-analytical report]. NISD. https://doi.org/10.53679/NISS-analytrep.2025.03

Bazyliuk Ya., Zhalilo Ya., Shemaieva L., Sobkevych O. & et al. (2026). *Ekonomichna bezpeka Ukrainy u novii hlobalnii arkhitekturi ryzykiv*: eksp.-analit. dop. [Economic security of Ukraine in the new global architecture of risks: expert-analytical report]. NISD. https://doi.org/10.53679/NISS-analytrep.2026.03

Biloshkurska N., Omelyanenko V., Yemets O. & et al. (2025). Comprehensive human security assessment in sustainable regional development: Insights for innovation policy. *European Journal of Sustainable Development Research, 4*(9), Art. em0315. https://doi.org/10.29333/ejosdr/16572

Fukuyama M. (2018). Society 5.0: Aiming for a New Human-centered Society. *Japan Spotlight, 27*, 47–50. https://www.hitachihyoron.com/rev/archive/2017/r2017_06/pdf/p08-13_TRENDS.pdf

Hitachi-U Tokyo Laboratory (2020). Society 5.0: A people-centric super-smart society. *Springer*. https://doi.org/10.1007/978-981-15-2989-4

International Liberty Institute. (2025). *Indeks ekonomichnoi bezpeky Ukrainy 2024* [Economic Security Index of Ukraine 2024]. Kyiv. https://www.ilibertyinstitute.org/index/ekonomichna-bezpeka

International Liberty Institute. (2026). *Indeks ekonomichnoi bezpeky Ukrainy 2025* [Economic Security Index of Ukraine 2025]. Kyiv. https://www.ilibertyinstitute.org/index/ekonomichna-bezpeka

Kalyuzhna N., Khodzhaian A. & Baron I. (2023). Economic security of Ukraine under the destructive influence of exogenous determinants. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu, 2*, 161–170. https://doi.org/10.33271/nvngu/2023-2/161

Koba O. (2021). System of economic security and levels of its formation. *Economics of Development, 3*(20), 40–47. https://doi.org/10.57111/econ.20(3).2021.40-47

Koundouri P. & Dellis K. (2023). Human security: Concepts and measurement. *Cadmus, 1*(5), 28–44. https://www.cadmusjournal.org/node/975

Kovalchuk O., Berezka K., Masonkova M., Chudyk N. et al. (2024). Statistical modeling of determinants influencing economic security in the context of sustainable development and national security. *Proceedings of International Conference on Applied Innovation in IT* (p. 197–203). https://doi.org/10.25673/115700

Menshikov V., Volkova O., Stukalo N. & Simakhova A. (2017). Social economy as a tool for ensuring national security. *Journal of Security and Sustainability Issues, 2*(7), 211–231. https://doi.org/10.9770/jssi.2017.7.2(4)

Ministerstvo ekonomiky Ukrainy. (2023). *Ofitsiina vidpovid na zapyt № ZI-952-23 vid 04.10.2023 shchodo nadannia publichnoi informatsii pro ekonomichnu bezpeku Ukrainy za period 2010–2022 rokiv* [Official response to request No. ZI-952-23 dated 04.10.2023 regarding the provision of public information on the economic security of Ukraine for the period 2010–2022]. Kyiv. https://dostup.org.ua/request/pokazniki_iekonomichnoyi_biezpie_5

Mints O. & Tolkachiova-Mints A. (2025). Analysis of the role of economic security among factors of well-being during global crises. *Public Security and Public Order, 2*(37), 232–234. https://doi.org/10.13165/PSPO-25-37-02-04

Nikitin A., Vdovychenko O. & Beschastnyy V. (2022). The role of law enforcement agencies in ensuring national and economic security of Ukraine. *Baltic Journal of Economic Studies, 4*(8), 110–116. https://doi.org/10.30525/2256-0742/2022-8-4-110-116

Onday O. (2019). Japan's Society 5.0: Going beyond Industry 4.0. *Business and Economics Journal, 2*(10), Art. 389. https://doi.org/10.4172/2151-6219.1000389

PROON v Ukraini. (2026). *Richnyi zvit PROON v Ukraini za 2025 rik. Stiike vidnovlennia ta inkliuzyvnyi rozvytok* [Annual Report of UNDP in Ukraine for 2025. Sustainable recovery and inclusive development]. UNDP Ukraine. https://www.undp.org/uk/ukraine/publications/richnyy-zvit-proon-v-ukrayini-za-2025-rik-stiyke-vidnovlennya-ta-inklyuzyvnyy-rozvytok

Samoiliuk M. Treker ekonomiky Ukrainy pid chas viiny [Tracker of the Ukrainian economy during the war]. *Tsentr ekonomichnoi stratehii*. https://ces.org.ua/tracker-economy-during-the-war/

Somych M., Opaliuk T., Potapiuk I. et al. (2022). Economic security of Ukraine: Management aspect through the prism of socio-economic development in the context of international ratings. *Politics & Policy, 4*(50), 810–833. https://doi.org/10.1111/polp.12481

Stryzhak O. (2022). Osoblyvosti vzaiemozviazku rivnia rozvytku liudskoho kapitalu y tsyfrovykh tekhnolohii u konteksti formuvannia suspilstva 5.0 [Features of the relationship between the level of human capital development and digital technologies in the context of the formation of society 5.0]. *Agricultural and Resource Economics, 3*(8), 224–243. https://doi.org/10.51599/are.2022.08.03.11

UNDP. (2024). *The 2023/2024 Human Development Report: Breaking the gridlock – Reimagining cooperation in a polarized world*. New York. https://hdr.undp.org/content/human-development-report-2023-24

UNDP. (2024). *Human Development Report: Ukraine statistical data 1990-2023*. New York. https://hdr.undp.org

UNDP. (2025). *Human Development Report 2025*. New York. https://hdr.undp.org/content/human-development-report-2025

World Bank. *World Development Indicators*. Washington, DC. https://databank.worldbank.org/source/world-development-indicators

Yankovskyi V. A., Tyshko O. Yu., Fomina O. O. & Karlin M. I. (2025). Natsionalni interesy v konteksti formuvannia «Society 5.0» [National interests in the context of the formation of "Society 5.0"]. *Naukovi pratsi DonNTU. Seriia ekonomichna, 1*, 4–11. https://doi.org/10.31474/1680-0044-2025-1(31)-4-11

Дослідження не отримувало зовнішнього фінансування.

Автори заявляють про відсутність конфлікту інтересів.

Під час підготовки роботи автори використали: ChatGPT (OpenAI, версія GPT-4/5) з метою покращення стилістики та редагування тексту; оформлення списку літератури. Автори перевірили та відредагували отримані матеріали.

Стаття надійшла до редакції / Received: 09.07.2026
Статтю прийнято до публікації / Accepted: 23.07.2026
Оприлюднено / Published: 17.08.2026