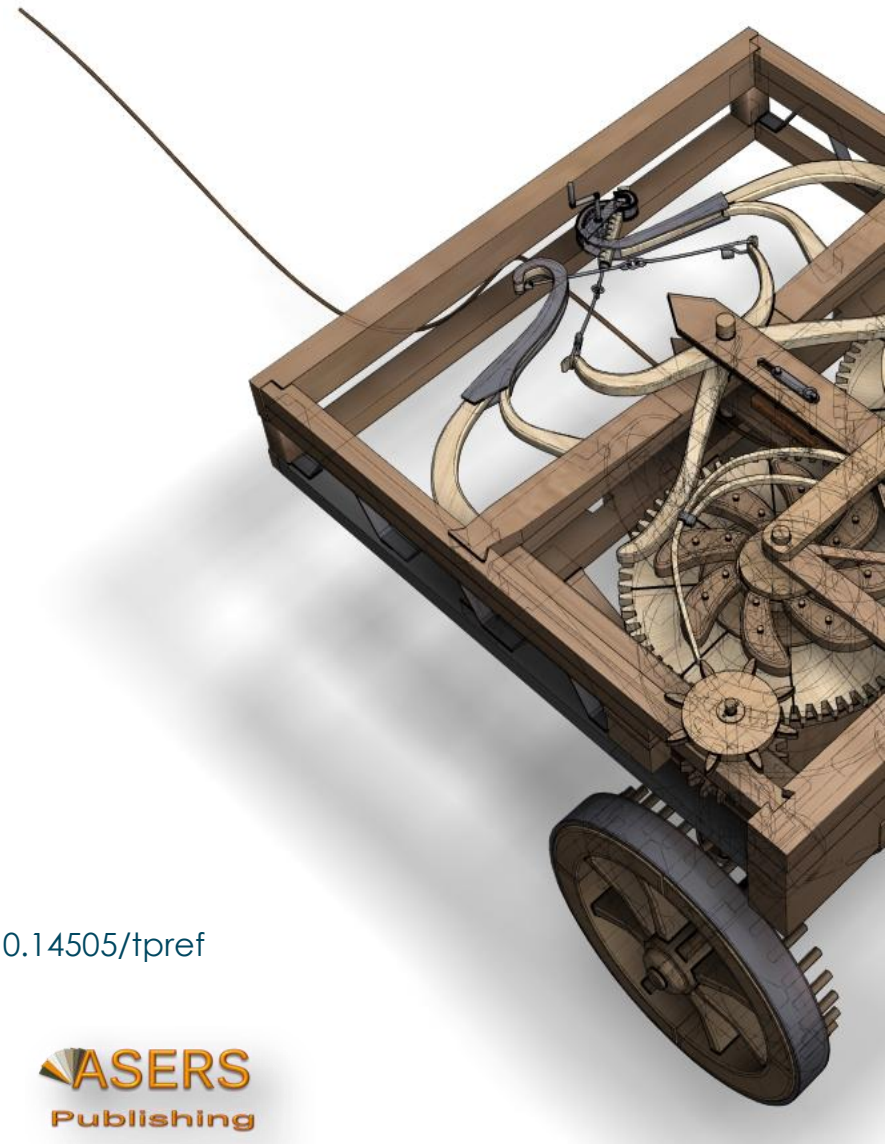
Theoretical and Practical Research in Economic Fields



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Theoretical and Practical Research in Economic Fields

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Socio-Economic Resilience of Ukraine as an Imperative of the Policy of Strengthening Migration Security and Minimizing Vulnerability

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Abstract: The management of migration processes in terms of ensuring their volumes within optimal limits to minimize social vulnerability is an imperative of the policy of ensuring socio-economic resilience in the context of instability, crisis, and the deepening of new challenges. The article aims to analyze the social vulnerability of Ukraine (on the example of the oblasts of the Carpathian region) in the context of the migration crisis and the weakening of security factors in 2010-2023 as determinants of reduced resilience of socio-economic systems. Based on the calculated composite indicators of social vulnerability, the authors find that the human resource donor regions (the oblasts of the Carpathian region of Ukraine) demonstrated a critical situation of social vulnerability of the population with a tendency to approach the lower marginal

threshold, which significantly weakened their migration security and led to a decrease in the socio-economic resilience of the country. The study reveals that the region demonstrated a critical situation of social vulnerability of the population with a tendency to approach the lower marginal threshold (the indicator in the Carpathian region of Ukraine was 0.499). The main triggers for the spread of social vulnerability, and thus the weakening of social resilience, included a decline in the standard of living, disruption of the demographic balance, and the poor quality of the social and labor sphere. In 2010-2015, the trend of ensuring social resilience in the Carpathian region reproduced to the national one, with the highest value of the divergence indicator in 2010 (3.2 pp) and the lowest in 2020 (0.9 pp). The results of the empirical study show that declining living standards, demographic imbalances caused by high migration activity, and structural imbalances in regional labor markets were the main triggers for the spread of social vulnerability and, consequently, the weakening of resilience. The conceptual model of the mechanism envisages analysis of the environment (identification of geopolitical and socio-economic factors influencing migration and assessment of current and potential threats), definition of goals and objectives, drafting scenarios for the development of the migration situation and the impact of each scenario on national security, selection of optimal solutions, and development of alternative planning for socio-economic resilience.

Keywords: security; resilience; vulnerability; Ukraine; migration; mechanisms; challenges; economic recovery; potential.

JEL Classification: O15; H56; I30.

Introduction

The intensification of migration processes that threaten national and economic security is an existential challenge for every country regardless of its level of socio-economic development. The scale of population emigration in the context of a critical weakening of security is a shock to the socio-economic resilience of territories, requiring timely regulation and adaptive minimization of risks and threats. The implementation of appropriate migration security mechanisms will ensure the controllability of migration processes and the efficient use of migration capital, reduce risks to the development and sustainability of the economic system, preserve intellectual and human resources, and increase the investment and financial potential of the territory. The resilience of the territory will also be facilitated by the effective use of the migration potential of certain elements of the country's socio-economic system, which are the driving force behind the development of small and medium-sized enterprises, the accumulation and commercialization of innovations and technologies, the balancing of the local labor market, etc.

The article offers a complementary study of the social vulnerability of the population and a conceptual and theoretical model of migration security as an imperative to ensure socio-economic resilience. The study is based on and develops the authors' previous research in the context of identifying cause-effect relationships in the system of increasing social vulnerability – weakening migration security – reducing resilience of the socio-economic system and substantiating the mechanisms of ensuring migration security and their impact on the socio-economic resilience of the country's regions (Boiko *et al.* 2021; Mulska *et al.* 2023a).

The study aims to analyze the social vulnerability of Ukraine (on the example of the oblasts of the Carpathian region) in the context of the migration crisis and the weakening of security factors in 2010-2023 as determinants of reducing the resilience of socio-economic systems. The objectives of the study include the identification of the degree of social vulnerability of the oblasts in the Carpathian region of Ukraine as human resource donor territories; identification of catalysts for strengthening and triggers for weakening vulnerability as determinants of the impact on migration security; substantiation of the conceptual model of mechanisms for ensuring migration security in the regions of Ukraine.

The article has the following structure. The first section presents a literature review. The second shows the research methodology. The third section presents the results of the study. The fourth section is devoted to the authors' opinion on the results obtained and substantiation of the conceptual (authors' model) mechanisms for ensuring migration security of the territory. The last section contains the concluding remarks.

1. Research Background

The socio-economic resilience of the country is an existential task, as well as a trigger and the object of attention of researchers (from the conceptual and methodological point of view) and practitioners (in the light of the development of political decisions) in the projection of identifying its state, factors, causes, and consequences, as well as substantiating the mechanisms and tools for its provision and management of the relevant processes. Therefore, the range of research on the issues of stable socio-economic development, security, and crisis management of the economy is expanding. In this environment, publications in the field of social development form a separate cluster. They deal with systemic and complex characteristics, such as sustainability (Aldrich & Meyer, 2015; Drury *et al.* 2019), security (Kaunert & Léonard, 2021), resilience (Léonard, 2020), wellbeing

(Mulska *et al.* 2023), safety (Voznyak *et al.* 2024), etc. Developments in this area imply the establishment of a comprehensive diagnosis and the application of a systematic approach to the management of the social progress of society.

It is worth mentioning that complex categories are perceived and defined differently in society, especially when they are considered at the intersection of social and psychological aspects. For example, attitudes towards certain goods or the depth of the same social problem are not the same in rich and poor societies (Djafar, 2012). The emphasis in research is differentiated depending on the situation in the country and thus the level and quality of life (Humphery, 2013). The greater the crisis, and even more so a full-scale war, the more urgent the issues of countering challenges and threats and ensuring resilience (Arends *et al.* 2023; Pfefferbaum *et al.* 2017; Levytska O. *et al.* 2022; Voznyak *et al.* 2024).

The strategic target orientation of the state policy of ensuring resilience is adapted in accordance with the level of development of society, the extent of social problems and threats in it, as well as the state's ability to resolve the situation and ultimately democratize the society and strengthen its middle class. There is no doubt that each of these cases is about the quality of life. However, the focus on resilience is more relevant and important when it comes to security (Brauch, 2011), both in terms of consequences and factors of its further destabilization (Bloom, 2014), as well as interactions, *e.g.*, intensification of migration processes and the development of social problems (Podgórzanska, 2019; Sperling & Webber, 2019) and, conversely, deterioration of the quality of life and increase of migration aspirations (Faist, 2004; Vezovnik, 2018).

The war in Ukraine has certainly exposed a wide range of problems and threats in various spheres and in virtually all components of national security. At the same time, migration security remains the main trigger for maintaining the country's resource, including human, potential for both preserving the country and restoring its economy in the postwar period in response to the most significant challenges such as forced population movements both within the country and abroad (according to UN estimates, migration caused by the war in Ukraine is recognized as the fastest and largest migration crisis since the Second World War), destruction of social and industrial infrastructure, and destabilization of labor and employment markets. The problems of its development and provision also relate to regional and local socio-economic and migration policies (Shubalyi & Gordiichuk, 2022), job creation, development of small, including innovative, businesses (Syrtseva *et al.* 2022), and regulation of youth mobility and their migration aspirations and attitudes (Vasyltsiv T. et al (2024)).

Research on the management of migration processes in the context of the socio-economic resilience of territories focuses on the study of risks and potential threats. Migration in the modern sense is a factor of socio-economic development of the countries involved in migration systems, whose main task is economic growth and socio-economic resilience in the context of instability and deepening globalization as ideologized by the International Organization for Migration. Migration risks of the "outflow" of highly skilled labor for human resource donor countries have long been the focus of attention of scholars worldwide (Andersson & Siegel, 2020). Theoretical studies have shown that brain drain depletes the human capital accumulated in human resource donor countries, reduces budget revenues, and thus leads to potentially large economic costs. Economic systems with a low level of human capital make less efficient use of other factors of production, so the loss of intellectual and human resources has critical consequences for both potential output and actual GDP growth rates (Alpaslan *et al.* 2021; Levytska *et al.* 2022).

Forming a "brain bank", which is a kind of intellectual and human resource environment in host countries for human resource donor countries, is a positive consequence of migration of highly skilled labor for ensuring the socio-economic resilience of the territory (Lupak *et al.* 2022). Scaling up the emigration of highly qualified personnel and generators of innovations is a trigger for gaining access to valuable knowledge accumulated abroad, increasing the efficiency of diaspora networks, and developing new centers for the transfer of innovations, know-how, etc. Migration contributes to the establishment and development of business cooperation between local economies and the economic systems of the migration resource destination countries.

The management of migration processes in terms of ensuring their volumes within optimal limits to minimize social vulnerability is an imperative of the policy of ensuring socio-economic resilience in the context of instability, crisis, and the deepening of new challenges. The stages of development of mechanisms are determined by the effectiveness of planning and programming for the development of territories, and the stages of implementation of mechanisms are determined by the effectiveness of organization and control (Wielechowski *et al.* 2021). The development of a comprehensive methodology for assessing social vulnerability as an information and analytical basis for studying the causes of weakening migration security of the country and its territories and the consequences of deepening negative impacts on economic security, the resilience of the socio-economic system, and the potential for economic growth are of existential importance.

Ensuring migration security in the system of socio-economic resilience of the territory has a complementary methodological and practical value, which is associated with the unique characteristics of migration processes as an object of regulation (*e.g.*, volumes, dynamics, risks for structural transformation of the economy, migration transfers, and entrepreneurial capital) of the variability of the relationship between the structural characteristics of migration and the parameters of economic security, resilience, and development (Tamasauskiene & Žičkienė, 2021). The policy of strengthening migration security and minimizing the socio-economic vulnerability of Ukraine is a trigger for the development of its resilience, as well as effective management of migration processes, state and regional migration policies, protection of national interests. and ensuring socio-economic resilience of the territories (Vasyltsiv *et al.* 2022). The conceptual model of migration security policy allows identifying key components, interactions between elements, potential threats, and ways to minimize risks. The conceptual model of the mechanism stipulates the analysis of vulnerability and environment (identification of geopolitical and socio-economic factors influencing migration and assessment of current and potential threats), definition of goals and objectives, development of scenarios of economic growth, migration situation, and impact of each scenario on economic security and resilience, selection of optimal solutions, and development of alternative socio-economic planning.

In recent academic discourse, social vulnerability is considered a multidimensional phenomenon that determines the capacity of populations to adapt to external risks, maintain social stability, and resist threats of natural, economic, or technological origin. Modern approaches to its assessment increasingly rely on the integration of geospatial methods, index analysis, and conceptual frameworks of resilience. Subham *et al.* (2024) proposed a comprehensive methodology for mapping urban social vulnerability using an index-based approach that incorporates exposure, sensitivity, and adaptive capacity of territories. Their study revealed clear spatial patterns of vulnerability in cities of West Bengal, emphasizing the importance of targeted interventions in urban environments. Cutter (2024) analyzes the evolution and diffusion of the Social Vulnerability Index (SoVI), highlighting its importance for formalizing assessments in the field of risk management. The author stresses the need to account for socioeconomic inequalities and ethnic stratification when calculating SoVI.

Expanding spatial approaches to the analysis of social vulnerability in the context of mobility in rural regions is demonstrated in the study by De Roulet *et al.* (2024), which applies a participatory GIS methodology to identify barriers to daily movement in Kenya and Nepal [64]. In a related context, Roy *et al.* (2024) employed the Sustainable Livelihood Security (SLS) approach to determine development priorities for vulnerable communities in regions of India, illustrating the integration of socioeconomic and environmental factors into strategic planning. The assessment of social vulnerability in connection with natural hazards is presented in the study by Asl *et al.* (2025), which identifies correlations between vulnerability indicators and flood risks for agricultural land and buildings. Spatial regression revealed key socioeconomic drivers that define vulnerability levels [67]. A similar topic is addressed by Sundqvist (2025), who examines a household-level social vulnerability index in Malawi, considering employment in agriculture. An innovative perspective is offered by Viana *et al.* (2025), who examine social vulnerability in the digital domain, particularly in the context of social engineering attacks. Their study identifies varying levels of vulnerability across generations of digital technology users, showing that social vulnerability is acquiring new forms in cyberspace.

The Ukrainian context of social vulnerability is explored in the work of Nebrat and Kurbet (2025), who emphasize the post-Soviet phenomenon of social paternalism as a factor shaping the structural vulnerability of the population. Their approach is based on a historical-social analysis of transformational processes and the corresponding behavioral models of the population.

The calculation of thresholds for catalysts, regressors, and social vulnerability components is a unique form of research, which allows comparing composite coefficients with thresholds to determine vulnerability/danger zones and safety margins. Unlike other studies of vulnerability and resilience (Mulska *et al.* 2022; Levytska *et al.* 2022; Vasyltsiv *et al.* 2022), the methodological and applied significance of this approach lies in a more thorough study of social vulnerability as a trigger for weakening migration security and a determinant of the decrease in the resilience of the country and its regions, including the identification of the limits of safe existence and development of socio-economic systems.

Security policy is based on the identification of challenges and threats that generate danger. In other words, eliminating a threat or danger is a direct way to guarantee the resilience, stability, and security of its target. A number of publications that directly or indirectly address the issue of the migration security of the state/territories (Keudel & Huss, 2023) analyze the main reasons for the intensification of external migration, in particular, critical in terms of volume and intensity external migration (Balzacq *et al.* 2016), which is primarily

related to the war and a high level of social (Panebianco, 2020; Williams, 2003) and economic (Umukoro, 2016) instability and deprivation in rural and remote areas (Shepherd, 2021; Lupak *et al.* 2022).

All the above-mentioned determinants of increased migration aspirations of the population are systemic and complex and thus create conditions and an environment in which the difficulties of adaptation become stronger than the problems and uncertainties associated with changing the place of permanent residence and labor and capital investment. The social vulnerability of the territory, or rather the population living there, has become a form, a reflection, and, at the same time, an indicator of strategic decision-making. It is specified from the point of view of the social resilience of the community (Magis, 2010; Angenendt, 2008), the links with poverty and inaccessibility of social services (Parker, *et al.* 2009), the consequences of natural disasters and other force majeure circumstances (Yoon, 2012), the impact of natural and anthropogenic environmental factors (Zahran *et al.* 2008), and the high level of risk inherent in a particular sector (Zou & Yi-Ming, 2010)

Social vulnerability is not a clearly defined concept and is multidisciplinary in nature, referring to an individual, a household, a community, a region, and a country. Social vulnerability is expressed in the inability to withstand stressful situations or risks. It increases in times of macroeconomic instability, political crises, and man-made and natural disasters (Bello, 2022). The study of social vulnerability is actualized through links and effects in chains of events: increase in social vulnerability (Metelev, 2016) → implementation of policies to improve social resilience (Mulska *et al.* 2023a) → strengthening migration security (Molnár & Vecsey, 2022), including the development of policy mechanisms, tools, and instruments (Diskaya, 2013) in the analyzed aspects, however, with a view to maintaining the resilience and stability of the functioning and development of the country's socio-economic system (Dmytryk *et al.* 2024) and those of its territories.

The study of social vulnerability of the population in the Carpathian region of Ukraine is of a practical nature. Its methodological basis is formed by theories of security, systems, social and human development, institutionalism, and risks and the concepts of quality of life and social conflict (Yoon, 2012; Zahran *et al.* 2008: Mulska *et al.* 2022). According to the authors, social resilience as an object of research, from the point of view of compositional analysis, requires both supplementation and equal consideration of a few of the specified and new (complementary) characteristics and features that consider the level and quality of life, parameters of social and labor relations, as well as aspects of demographic, environmental, and food security. This method allows, on the one hand, to more systematically analyze and diagnose the state of social vulnerability, identifying the full range of challenges, risks, and threats that weaken the social resilience of the population, and, on the other hand, to differentiate the tools and means of state policy to strengthen the migration security of the state and its territories, especially socially vulnerable in terms of complex social, economic, and natural conditions, external challenges, instability and crisis, structural transformations, and even war.

2. Materials and Methods

To study the social vulnerability as a cause of weakening migration security and a trigger for reducing the socio-economic resilience of Ukraine, the following hypothesis was developed and tested:

H: *Migration security is a determinant of the country's socio-economic resilience, and its weakening is determined by a critical increase in social vulnerability, which has a permanent reverse effect on the Ukrainian economy and society in the long run.*

The study consists of four stages:

1. Development of the information and analytical basis for the study of social vulnerability and selection of the research object (oblasts of the Carpathian region of Ukraine). The region was chosen because the oblasts of the Carpathian region are the largest donor territories of human resources from Ukraine to the EU countries.
2. Generation of an empirical indicator of social vulnerability based on the spatio-temporal approach
3. Building a social vulnerability-resilience plateau of Ukrainian oblasts, considering the scenario of weakening migration security.
4. Substantiation of the conceptual model of migration security mechanisms.

The decomposition of social resilience using the system-structural approach is represented by 6 components:

- *component I. Quality of social and labor relations* (employment rate of the population aged 15-70, % of the total population of the corresponding age; level of recruitment, % of the average number of full-time employees; number of individual entrepreneurs, per 1,000 population; employment rate of the registered unemployed, %; the level of working time losses, %; the ratio of the number of registered unemployed to the number of available jobs, persons; level of informally employed population, % of the employed population; share of employees engaged in work with hazardous working conditions, % of the average number of full-time

employees; unemployment of the total population aged 15-70, % of the population of the corresponding age; level of forced part-time employment, % of the average number of full-time employees; rate of employee dismissal, % of the average number of full-time employees);

- *component II. Standard of living* (average monthly nominal wages, €, on average per full-time employee; pension benefits, € per €1,000 of GRP; disposable income, € per capita; Internet coverage, % of the total population; average state assistance to low-income families and to unemployed, €; state budget expenditures on health care, social protection, social security, and education, € per capita; average benefits and subsidies (non-cash) for housing and communal services, electricity, and fuel, €, per household; average monthly pension for all categories of pensioners, €; the ratio of the average monthly pension to wages, %; consumer price index, % y-o-y; share of total household expenditures on food, %, per household per month; dilapidated housing stock, total area of residential premises, m2 per 1,000 population; share of wages in total income of the population, %; the ratio of the subsistence minimum to the average monthly wage; wage arrears per full-time employee, €; population with average monthly per capita equivalent total income below the actual subsistence level, % of the total population; decile coefficient of differentiation of total income);
- *component III. Quality of life* (coverage of children by preschool education institutions, % of the number of children of the corresponding age; share of households with no employed persons, %; share of households whose housing is equipped with water supply and sewerage and has convenient access to public transport, %; hospital beds per 1,000 population; visits to outpatient facilities per shift per 10,000 population; coverage of the population with medical personnel, persons per 100,000 population; housing stock per capita, m2 of total area; teachers of 3 and 4 accreditation levels higher education institutions per 1,000 students; research and teaching staff with a candidate and doctoral degree per 100 graduate students; share of the population living in overcrowded housing, %; share of the population aged 6 and older with higher education, %; places in residential care homes for the elderly and people with disabilities per 100,000 population; general secondary and higher education institutions per 100,000 population; recorded crimes per 1,000 population; morbidity, newly registered cases of diseases per 1,000 population.
- *component IV. Demographic security* (children per 1,000 population; total fertility rate; average life expectancy at birth, years; total marriage rate per 1,000 population; share of households with 3 or more children, %; elderly people per 1,000 population; demographic load factor, %; disabled people per 10,000 population; marriage instability rate, %; out-migrants per 10,000 population; share of single-parent families with children, %; mortality rate for children under 1 year of age per 1,000 newborns);
- *component V. Environmental security* (water withdrawal from natural water bodies, m3 per person; fresh water consumption, m3 per person; total water disposal, m3 per person; capacity of treatment facilities, m3 per person; waste recycling rate; share of built-up land, %; share of capital investment in environmental protection in GRP, %; share of current environmental protection costs in the GRP, %; share of land in the nature reserve fund, %; current environmental protection costs, € per person; share of agricultural land area, %; discharge of contaminated wastewater into surface water bodies, m3 per person; emissions of pollutants into the atmosphere from stationary sources, tones per 1,000 population; waste generation, tonnes per person);
- *component VI. Food security* (the ratio of daily caloric intake to the daily norm; consumption of meat, oil, fruits, berries, eggs, fish, fish products, sugar, milk and dairy products, potatoes, vegetables, bread, and bread products in relation to the norm, per person; share of the population aged 18 and over with low body weight, %).

Formulas (1-2) were used to normalize the indicators (catalysts and regressors) according to the criterion of distance to thresholds, respectively.

$$z_{itn}^{k} = \begin{cases} 2^{(1-\frac{a_{in}}{x_{itn}})/ln10/3}, & x/a > 1 \\ 2^{-log_{\frac{10}{3}}a_{in}/x_{itn}}, & x/a \leq 1 \end{cases} \quad (1)$$

$$z_{itn}^{r} = \begin{cases} 2^{(1-\frac{x_{itn}}{a_{in}})/ln10/3}, & x/a < 1 \\ 2^{-log_{\frac{10}{3}}x_{itn}/a_{in}}, & x/a \geq 1 \end{cases} \quad (2)$$

where z_{itn}^{k} is the normalized value of the i catalyst indicator of the n region in the t period; z_{itn}^{r} is the normalized value of the i regressor indicator of the n region in the t period; a_{in} is the threshold of the i indicator of the n region; x_{itn} is the initial value of the i indicator of the n region in the t period.

The proposed methodological approach to the study of social resilience differs in the simultaneous normalization of indicators and their thresholds (Formula 3).

$$a_i = \begin{cases} a_{ik}/a_{norm}, & a_{norm} \geq a_{max} \\ a_{norm}/a_{ir}, & a_{norm} \leq a_{min} \end{cases}, \quad (3)$$

a_i is the normalized value of the i indicator; a_{ik} is the initial value of the threshold of the i-catalyst indicator; a_{ir} is the initial value of the threshold of the i regressor indicator.

It is worth mentioning that the upper thresholds (marginal and optimal) become lower in the process of determining the thresholds of the regressor indicators.

The calculation of weighting coefficients that are constant during the study period significantly undermines the scientific and practical value of the obtained results. The criterion of the constancy of the values of the weighting coefficients for the calculation of composite scores does not meet the conditions of a changing socio-economic environment and contradicts the concept of dynamic equilibrium. Significant changes in the socio-political, foreign, and macroeconomic situation in the country and its regions are triggers of structural transformations that lead to changes in the empirical assessments of both the components of social resilience and their interrelations. Structural and quantimetric transformations of system interrelations cause changes in the weighting effects of indicators on the problem under study. Therefore, methods based on the construction of static weighting coefficients of indicators demonstrate an average pattern and do not consider the exact correspondence of the situation in the dynamics. The construction of a dynamic series of weighting coefficients based on the theory of sensitivity permits correcting this drawback. Formula 4 was used to calculate the dynamic weights of the social resilience indicators and components.

$$w_{itn}^m = \frac{|\mu_{in}^m \Delta x_{itn}^m|}{\sum_{i=1}^j |\mu_i \Delta x_{it}^n|}, \quad (4)$$

where w_{itn}^m is the weight of the i indicator of the m group of the n region in the t period; μ_{in}^m is the sensitivity ratio of the i indicator of the m group of the n region; Δx_{itn}^m is the coefficient of change of the i indicator of the m group of the n region in the t period; j – number of indicators in each group.

The weighting coefficients of the indicators within each group of indicators are calculated using formula (5):

$$Y_{itn}^m = z_{itn}^{w_{itn}^m}, \quad (5)$$

where Y_{itn}^m is the weighting coefficient of the i indicator of the m group of the n region in the t period.

Dynamic series of empirical indicators of the components and the composite index of social resilience are constructed based on a multiplicative approach using formulas (6-7):

$$Cmp_{mt}^n = \prod_{i=1}^j Y_{itn}^m, \quad (6)$$

$$ISS_t^n = \prod_{k=1}^l Cmp_{mt}^n, \quad (7)$$

where Cmp_{mt}^n is the weighting coefficient of the m social resilience component of the n region in the t period; ISS_t^n is the composite index of social resilience of the n region in the t period; l is the number of social resilience components.

3. Research Results

The construction of social resilience indices using the structural-temporal approach allows comparing the dynamics of component indices and thresholds on the same scale (Application 1-5). This comparative analysis helps to identify the state of social resilience, while deviations from thresholds indicate the state of social vulnerability of the territory. According to the results of the calculations, the state of social resilience of the population in Zakarpatska oblast is in a dangerous and critical zone – below the lower threshold value – in two components (quality of social and labor relations and standard of living). Social resilience in terms of the quality of life, demographic security, and food security components balances between the lower optimal and marginal values, while environmental security is in the pre-crisis zone.

The average value of the empirical indicator of the quality of social and labor relations in Zakarpatska oblast in 2010-2023 was 0.528, which is 5.0 pp less than the lower marginal threshold and 13.9 pp less than the lower optimal threshold. Such dynamics of deviations of the current values of the component index from the average thresholds determine the unsatisfactory state of the employment sector and the low level of labor market competitiveness in the region (Application 1). The critical situation regarding social resilience in Zakarpatska oblast is observed in the standard of living component, where the deviation from the lower marginal threshold was

43.6 pp, and from the lower optimal threshold – 50.9 pp. The main reason for the low standard of living in Zakarpatska oblast is that a few indicators are below the lower marginal threshold, which poses a threat to ensuring decent living conditions and is a trigger for the spread of social vulnerability. These indicators are average monthly nominal wages, pensions, disposable income, and the consumer price index.

The components of the quality of life, demographic security, and food security of Zakarpatska oblast balance between the lower marginal and lower optimal thresholds. The deviations of the average component indicator from the lower marginal threshold for the period under study were 2.4 pp, 7.0 pp, and 3.2 pp, respectively, and from the lower optimal threshold – 2.5 pp, 28.3 pp, and 6.7 pp, respectively. The drivers of maintaining below-moderate levels of social resilience in the projection of these components in the region include:

- population morbidity, share of households with no employed persons, number of general secondary education institutions, number of higher education institutions, number of teachers of 3 and 4 accreditation levels higher education institutions (*quality of life component*);
- total fertility rate, total marriage rate, marriage instability rate (*demographic security rate*);
- ratio of daily caloric intake to the daily norm, the share of the population aged 18 and over with low body weight, consumption of oil, bread, and bakery products in relation to the norm (*food security component*).

The environmental resilience of Zakarpatska oblast is in an extremely critical state. Only in 2010-2011 and 2015 did the empirical values of the component approach the lower marginal thresholds. The dynamics of deviations from the lower optimal values over the period under study was 28.3 pp, and from the upper marginal threshold – 71.9 pp. Therefore, 8 out of 14 indicators (57%) pose a threat to the region's social resilience in terms of environmental resilience. These include the use of fresh water, discharge of contaminated wastewater into surface water bodies, capacity of treatment facilities, emissions of pollutants into the atmosphere from stationary sources of pollution, waste recycling rate, current environmental protection costs, share of capital investments in environmental protection in the Gross Regional Product, share of current environmental protection costs in the Gross Regional Product.

The calculations of the state of social resilience of Ivano-Frankivska oblast for 2010-2023 show that the vulnerability of the population is increasing in such components as the quality of social and labor relations and the standard of living. The levels of deviations of the mean values of the component indices from the lower marginal threshold were 17.1 pp and 41.5 pp, respectively, and from the lower optimal threshold were 26.5 pp and 49.3 pp (Application 2). The catalysts for the spread of social vulnerability in these components in the region were:

- recruitment rate, dismissal rate, number of individual entrepreneurs, the ratio of the number of registered unemployed to the number of available jobs, unemployment rate of the total population aged 15-70 *(quality of social and labor relations component*);
- pension, disposable income, consumer price index, Internet coverage, average amount of state social assistance to low-income families, average amount of benefits and subsidies (non-cash) for housing and communal services, electricity, and fuel per household, unemployment benefits, average monthly nominal wages (*standard of living component*).

There is a steady trend of permissible deviations of social resilience from the lower marginal thresholds for the quality of life (3.5 pp) and demographic security (1.9 pp) components in Ivano-Frankivska oblast in 2010-2023. During the period under study, the empirical values of the component indices did not fall below the lower marginal threshold, except for demographic security in 2017.

The dynamics of the environmental security component index in Ivano-Frankivska oblast is sigmoidal, with a downward trend in 2012 (the indicator value was 0.437 with a lower marginal threshold of 0.410), in 2016 (0.401), and in 2019 (0.405). It is worth mentioning that the environmental resilience of the region in 2011 and 2018 balanced between the lower and upper optimal thresholds, which demonstrated the tendency of the region to be in the range of "safety margin". Meanwhile, the empirical indicators of the food security component were in the "social vulnerability" zone during the study period but not below the critical level. The deviation from the lower marginal value was around 1.3 pp.

The catalysts for increasing the social vulnerability of the population of Ivano-Frankivska oblast in 2010-2023 in the projection of weakening environmental safety included general sewage, the discharge of polluted wastewater into surface water bodies, the capacity of treatment facilities, the current environmental protection costs, and the share of land in the nature reserve fund. The dynamics of deviations of these indicators from the optimal thresholds during the study period increased by 0.8% annually and from the marginal thresholds – by 1.5%. The regressors of the weakening of social resilience in Ivano-Frankivska oblast in the food security component were the consumption of eggs, vegetables, fruits, berries, and meat in relation to the norm. Deviations from the optimal thresholds ranged from 0.7% to 0.9%.

Among all the components of social resilience in Lvivska oblast, the critical situation was observed only for the standard of living component, whose empirical values were below the lower marginal threshold throughout the entire study period. The average deviation of the indicators for 2010-2023 was 44.1 pp and 76.5 pp from the lower and upper marginal thresholds, respectively, and 52.5 pp and 63.4 pp from the lower and upper optimal thresholds, respectively (Application 3). The critical spread of social vulnerability in the region was observed during periods of crisis, with the lowest empirical values of the standard of living component being 0.199 in 2012, 0.203 in 2015, and 0.135 in 2021.

The quality of life, demographic security, and food security components balanced between the lower marginal and lower optimal thresholds. Thus, the average deviation from the lower optimal threshold was 6.8 pp, 7.2 pp, and 5.8 pp, respectively. Interestingly, the social vulnerability of the population in Lvivska oblast in terms of the quality of life, demographic security, and food security components was below the moderate level with a tendency to the zone of "margin of safety". Therefore, the catalysts of the region's social resilience in these components were:

- number of recorded crimes, morbidity of the population, the share of households with no employed people, number of general secondary education institutions, number of teachers of 3 and 4 accreditation levels of higher education institutions, the share of households with water supply and sewerage (*quality of life component*);
- mortality rate of children under 1 year of age, number of out-migrants, total marriage rate (*demographic security component*);
- ratio of daily caloric intake to the daily norm, consumption of sugar and potatoes in relation to the norm (*food security component*).

In 2010-2023, the environmental resilience of Lvivska oblast demonstrated a tendency to approach the zone of "social vulnerability", except for 2010-2011 and 2016, when the empirical indicators of environmental security reached critical values. The deviations of the current environmental security values from the upper and lower marginal thresholds amounted to 3.2 pp and 62.2 pp, and from the upper and lower optimal thresholds – 18.6 pp and 38.8 pp, respectively. Challenges for Lvivska oblast, as well as for other oblasts of the Carpathian region of Ukraine, in terms of ensuring environmental resilience include illegal deforestation, river pollution, waste disposal, environmental losses from mining activities, as well as sanitary felling more than the limits established by law. Therefore, the catalysts for the spread of vulnerability of the population against the background of weakening environmental security are the use of fresh water, discharge of contaminated wastewater into surface water bodies, emissions of pollutants into the atmosphere from stationary sources of pollution, waste generation, waste utilization rate, and current environmental protection costs. The current values of these indicators are 20-22 pp below the lower marginal thresholds.

The empirical values of the quality of social and labor relations in Lvivska oblast in 2010-2023 ranged within the "social vulnerability". In 2011-2014, there was a clear downward trend in the indicators, while in 2016-2023, on the contrary, there was an upward trend. The deviation from the lower marginal threshold was 8.6 pp and from the lower optimal threshold – 17.4 pp. The non-critical situation in the quality of social and labor relations component of social resilience in the Carpathian region is explained by the high degree of sensitivity of Lvivska oblast's labor market to modern transformations in the employment sector, especially the development of virtual and informal employment and the formation of IT clusters that contributed to the spread of non-standard forms of employment and the scaling of individual entrepreneurship.

Accordingly, the catalysts for maintaining a moderate level of resilience of social and labor relations during the study period included the employment rate of the population aged 15-70, the number of individual entrepreneurs, the level of informally employed population, the employment rate of the registered unemployed, and the ratio of the number of registered unemployed to the number of available jobs (the indicator for 2019-2023 decreased by 3 times). A similar situation in terms of social resilience was observed in Chernivetska Oblast in 2010-2023 (Application 4). The indicators of the standard of living component were critically low (especially in 2011), with an average value of 0.198 (for comparison, the lower marginal threshold was 0.675). The deviations from the lower and upper optimal thresholds were 52.4 pp and 63.3 pp, respectively. The following factors had the greatest impact on the spread of social vulnerability against the background of declining living standards in Chernivetska oblast, with deviations from the threshold values of around 55-62 pp: the average monthly nominal wage, disposable income, consumer price index, the share of total household expenditures on food, the decile coefficient of differentiation of total income, the average amount of benefits and subsidies (non-cash) for housing and communal services, electricity, and fuel, unemployment benefits, and the average amount of the monthly pension for all categories of pensioners.

The empirical indicators of the quality of social and labor relations in Chernivetska oblast were in the critical zone, below the lower marginal threshold. The deviation of the average indicator from the optimal thresholds is 15.7 pp (lower) and 28.6 pp (upper). A significant increase in the social resilience of the region in the projection of ensuring the quality of social and labor relations was observed in 2016-2019 (from 0.533 to 0.575). The Covid-19 pandemic has triggered negative transformations in the labor market, a significant increase in the rate of employee dismissals, transfer to part-time work, and a decrease in the number of individual entrepreneurs, which has launched a chain of causality with other catalysts for weakening the resilience of the employment sector in Chernivetska oblast. The following indicators are regressors of the weakening of social resilience in the region: the rate of dismissal of employees, the level of informally employed population, the number of individual entrepreneurs, the level of working time losses, the ratio of the number of registered unemployed to the number of available jobs, the unemployment rate of the total population aged 15-70, and the level of forced part-time employment.

According to the calculations, the quality of life, demographic security, and food security in Chernivetska oblast in 2010-2023 were in the zone of "social vulnerability" without approaching the critical zone. The average value of the empirical indicator of quality of life was 0.591, which was 2.1 pp higher than the lower marginal threshold, and the average value of the empirical indicator of demographic security was 0.654, which was 2.5 pp higher than the lower marginal threshold. The dynamics of the empirical values of the food security component of social resilience over the study period had an upward trend, and in 2020 it balanced in the "safety margin" zone. Interestingly, the indicators that stimulated social resilience in the region were:

- coverage of children by pre-school education institutions, number of hospital beds, coverage of the population with medical personnel, number of general secondary education institutions, number of research and teaching staff with a candidate and doctoral degree, share of households with water supply and sewerage (quality of life component);
- number of children, demographic load ratio of the able-bodied population to the disabled, total marriage rate, share of single-parent families with children, marriage instability rate (demographic security component);
- ratio of daily caloric intake to the daily norm, share of the population aged 18 and over with low body weight, sugar and oil consumption in relation to the norm (food security component).The environmental situation in the Carpathian region has been forming over a long period of time due to the neglect of the objective laws of development and reproduction of natural geosystems and is characterized by excessive techno- and anthropogenic pressure on the environment and a high degree of pollution. Therefore, it is crucial for Chernivetska oblast, as well as for other oblasts of the Carpathian region of Ukraine, to address the problem of diversification of sources of financial and investment support for integrated environmental management through changes in inter-budgetary relations regarding the distribution of rent for special use of natural resources, land fees, and environmental tax, which provides for an increase in the share of these payments to local government budgets. Therefore, such indicators as current environmental protection costs, the share of capital investments in environmental protection in GRP, and the share of current environmental protection costs in GRP were stimulators for strengthening social and environmental resilience in the region. It is worth mentioning that environmental resilience was in the zone of social vulnerability, and in 2012-2013, 2016, and 2021-2023 it was in the zone of social resilience. The average value of the empirical indicator of environmental resilience in Chernivetska oblast for 2010-2023 was 0.510, which is 13.2 pp higher than the lower marginal threshold but 2.3 pp below the lower optimal threshold.

Ukraine was in the zone of social vulnerability by all components of social resilience in 2010-2023, except for the standard of living component (critical vulnerability range). For comparison, the average value of the quality of social and labor relations component for Ukraine and the Carpathian region was 0.481 and 0.499, respectively, which is 8.4 pp and 9.6 pp less than the lower marginal threshold, respectively (Application 5). Ensuring the effective employment of the population and the creation of new high-tech and high-performance jobs are catalysts for the optimal level of social resilience of the territory in the focus of guaranteeing high quality of social and labor relations. During periods of crisis, the so-called labor market security balanced at a critical level (the empirical indicator of the quality of social and labor relations component in Ukraine in 2014 was 0.439, and in the Carpathian region – 0.417). It is worth mentioning that to strengthen social resilience, the focus is on the development of fundamentally innovative measures to create well-paid jobs, which will ultimately help reduce real unemployment, increase effective employment and labor and capital productivity, reduce external labor migration, and ultimately minimize the effects of the shortage of workers.

The results of the study show that precarious and informal employment are both catalysts and regressors

of social resilience. For example, in 2010-2023, the values of the quality of social and labor relations component were below the social vulnerability threshold, indicating significant negative transformational changes in the labor market, which only intensified and led to a drain on human resources and an increase in personnel hunger in the country and especially in the border regions. In the context of instability caused by globalization and socio-political upheavals, state regulation of precarious and informal employment was a measure to reduce risks and costs for enterprises and create opportunities for employment on flexible terms, which increased the adaptability of labor relations to changes in the economic situation and contributed to the development of the labor potential of the economically active population. On the other hand, such forms of employment created the basis for the spread of precarization processes in the economy of the country and the Carpathian region, which resulted in an increase in the shadowing of employment and the spread of hidden unemployment, a shortfall in state budget tax revenues, etc.

A slight differentiation in the average values for Ukraine and the Carpathian region was observed for the quality-of-life component (0.667 and 0.643, respectively). Throughout the entire period under study, Ukraine and the Carpathian region were in the zone of social vulnerability, with deviations from the lower marginal value of 5.6 pp and 3.2 pp, respectively. Meanwhile, the largest differentiation between Ukraine and the Carpathian region was observed in the environmental security component. Therefore, the average value of the empirical indicator of environmental resilience in 2010-2023 was 0.598 for Ukraine and 0.388 for the Carpathian region. The average indicator for Ukraine exceeds the lower marginal threshold by 19.1 pp (in the Carpathian region - lower by 0.2 pp).

The comparative analysis of demographic security as a component of the social resilience of Ukraine and the Carpathian region confirms the thesis of disproportionate development of demographic resilience indicators. The most significant threats to the demographic security of Ukraine and the Carpathian region (in terms of distance from the upper marginal threshold) include ultra-low net reproduction rate (per woman) and high mortality rate of the population in general and children under one year of age in particular. A critical scale of external migration (labor, educational, and stationary), which leads to a decrease in the labor force and an increase in the demographic burden on the working population, is an existential challenge for the demographic security of the Carpathian region as a border area.

According to the average annual rate of change in the level of social resilience in 2010-2023, the demographic security of Ukraine as a whole and the oblasts of the Carpathian region showed a negative trend. Lvivska oblast showed the most negative trends in the weakening of demographic security every year during the study period (the average annual rate of change was -0.71%). Almost the same value of the average annual change in the empirical indicator of demographic security was recorded in Zakarpatska oblast (-0.52%), while the national average value of the weakening of demographic security was 0.56%. The main catalysts for this trend, especially in Zakarpatska and Lvivska oblasts, included external migration, which reached critical levels and eventually led to other negative demographic consequences (deformation of the age and sex structure of the population, depopulation of the territory, a significant decrease in the number of women of childbearing age, etc.). Meanwhile, a significant decrease in the fertility rate (2-fold in 2010-2023) and marriage rate (1.5-fold), and an increase in the mortality rate (1.1-fold) were the existential determinants of the weakening of Ukraine's demographic security. The average annual rate of change in the levels of demographic security in Ivano-Frankivska and Chernivetska oblasts was -0.46% and 0.4%, respectively.

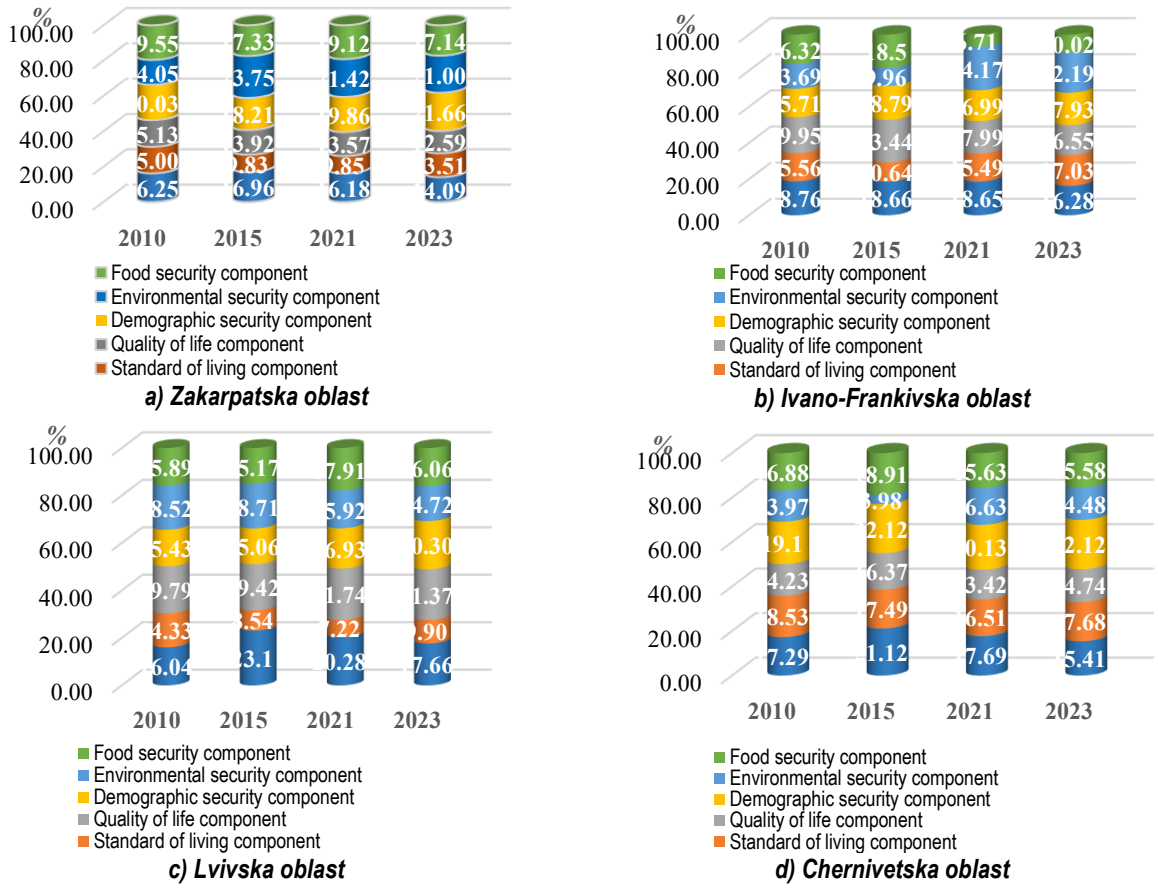
Interestingly, the average annual rates of change of other components of social resilience in Ukraine and the oblasts of the Carpathian region in 2010-2023 were positive, indicating a positive trend of strengthening environmental (except for the Zakarpatska oblast, where its weakening by 0.75% was observed) and food security (except for the national average, the change was -0.11%). Despite the increasing differentiation of the current values of the quality of life and standard of living components from the lower marginal and optimal thresholds, the average annual rates of change of these components of social resilience showed an upward trend. For example, the average annual changes in the quality of life and standard of living were 0.17% and 0.55%, respectively, for Ivano-Frankivska oblast, and 0.05% and 0.1%, respectively, for Chernivetska oblast. Meanwhile, the average annual rate of change in the quality-of-life indicator decreased by 0.23% in Zakarpatska oblast and by 0.48% in Lvivska oblast.

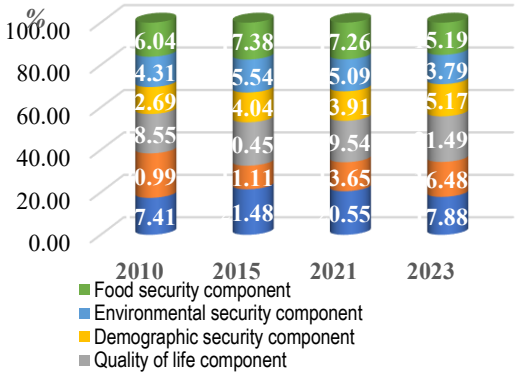
The quality of social and labor relations component had a positive dynamic of changes in average annual rates, except for the indicator for Ukraine as a whole (-0.06 %). For example, the average annual rate of change in the quality of social and labor relations in Ivano-Frankivska oblast was 1.75%, the main factor being the creation of a significant number of new jobs in the service sector and thus an increase in employment and labor productivity and a reduction in real and hidden unemployment. A significant increase in the number of individual

entrepreneurs in the IT and service sectors is also observed in the Carpathian region, which also indicates an increase in employment, especially informal and precarious employment.

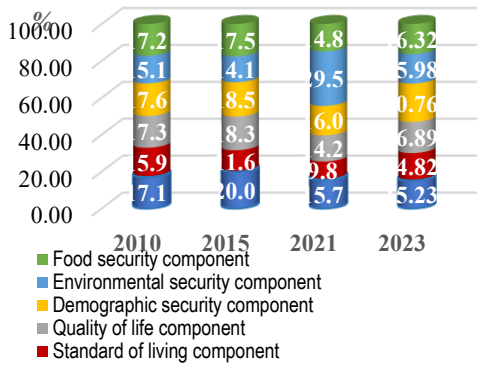
The calculated weighting coefficients of the components' influence on ensuring social resilience indicate differentiated significance, which correlates with the periods of crisis and socio-economic development (Figure 1). For example, in 2010, the social resilience of Zakarpatska oblast was mostly ensured by such components as the standard of living and quality of life (weighting coefficients were 21.0% and 18.6%, respectively), while during the socio-economic and socio-political crisis (2015), by the quality of social and labor relations and quality of life (21.5% and 20.5%, respectively). It is worth mentioning that the standard of living had the greatest weighting influence on the social resilience of the region during the study period but decreased during the crisis period, while the influence of the quality of social and labor relations component increased. In 2014-2015, the weight of the standard of living component decreased from 17.8% to 11.1%, while the weight of the quality of social and labor relations component increased from 16.9% to 21.5%. A similar situation was observed in 2020-2021, during the period of the global pandemic, which had a negative impact on the development of regional economies. The weight of the standard of living component decreased from 24.5% in 2020 to 13.7% in 2021, and the quality of social and labor relations component increased to 20.6%, which is 4.6 pp more than in 2020.

Figure 1. Weight significance of the social resilience components of Ukraine and the oblasts of the Carpathian region, 2010, 2015, 2021, 2023, %





e) Ukraine



f) Carpathian region

Source: compiled based on the authors' calculations

The components with the highest weight in Ivano-Frankivska oblast in 2010-2011 were the quality of life (20.0 % and 20.6 %, respectively) and demographic security (15.7 % and 16.0 %, respectively), in 2014-2015 – the quality of social and labor relations (18.7 % and 22.3 %, respectively) and the quality of life (19.1 % and 23.4 %, respectively), in 2020 – the standard of living and the quality of life (22.3 % and 22.5 %, respectively), and in 2021 – environmental security (24.2 %) and the quality of social and labor relations (18.7 %). Interestingly, the weight of food security in ensuring the social resilience of the region ranged from 15.8% to 18.5% (except for 2012-2013, when the weight was 13.2% and 14.5%, respectively).

The social resilience of Lvivska oblast in 2010-2023 was determined to the greatest extent by the weight of three components – quality of social and labor relations, standard of living, and quality of life. In 2014, the weighting coefficient of the standard of living component in the oblast was 34.5 %, and in 2020-2021, the weight of the quality-of-life component was 19.9 % and 21.7 %, respectively. Interestingly, a decrease in the weight of the quality-of-life component and an increase in the weight of the environmental security component are observed during periods of economic stability. For example, in 2011-2012, the weight of the quality of social and labor relations decreased from 19.8% to 9.0%, while the weight of environmental security increased from 7.4% to 49.4%, which is determined by the increase in capital expenditures for environmental protection. During the period of Covid-19 (2020-2021), the weight of environmental security decreased by 0.5 pp and 3.4 pp, respectively, and the standard of living by 1.1 pp and 9.6 pp, respectively, compared to 2019.

Compared to other oblasts of the Carpathian region, Chernivetska oblast had the most permanent distribution of the weight of the components' impact on social resilience in 2010-2023, apart from the environmental component, whose weighting dynamics was sigmoidal. For example, it was 13.1-14.1% in 2012-2013, 4.0% and 41.6%, respectively, in 2015-2016, and 17.2% and 13.2, respectively, in 2018-2019. During the periods of socio-economic uncertainty (2014) and the spread of the pandemic (2020) in the region, the standard of living (20.8% and 24.6%, respectively) and demographic security (16.4% and 16.8%, respectively) had the greatest impact on social resilience. Meanwhile, in 2010, the standard of living and quality of life had the greatest influence on the development and maintenance of Ukraine's social resilience (21.0% and 18.6%, respectively), while in 2015 and 2021, it was the quality of social and labor relations (21.5% and 20.6%, respectively) and quality of life (20.5% and 19.5%, respectively).

In 2023, against the backdrop of Russia's full-scale war against Ukraine, significant changes occurred in the structure of the importance of social resilience components, both at the national level and within the regions of the Carpathian area. These shifts reflect the adaptive processes triggered by military threats and socio-economic challenges. At the national level, the importance of the quality-of-life component increased to 21.49%, up from 19.54% in 2021. This rise may be attributed to the intensification of volunteer initiatives, the expansion of social services, and the provision of humanitarian aid. At the same time, there was a notable decrease in the social and labor relations component (from 20.55% to 17.88%), indicating a weakening of institutional and interpersonal ties under critical conditions. The standard of living component rose from 13.65% to 16.48%, reflecting efforts to stabilize the economic situation. Demographic security increased by 1.26 percentage points to 15.17%, possibly in response to the threat of losing human capital. Meanwhile, environmental and food security declined to 13.79% and 15.19%, respectively.

In Zakarpattia Oblast, the most significant components in 2023 were demographic security (21.66%) and environmental security (21.00%), reflecting the increasing relevance of preserving the population and natural environment as key development resources. Conversely, the quality of social and labor relations declined to

14.09%, down from 16.18% in 2021 - marking the lowest value recorded over the analyzed period. After a drop in 2015 and 2021, the standard of living component rose from 9.85% to 13.51%, while the quality of life decreased to 12.59%. In Ivano-Frankivsk Oblast, there was a notable increase in the environmental security component (22.19%) and consistently high values in demographic security (17.93%). Meanwhile, the quality-of-life component decreased from 17.99% to 16.55%, and social and labor relations dropped to 16.28%. Notably, food security, which accounted for only 6.71% in 2021, rose to 10.02% in 2023. In Lviv Oblast, the quality-of-life component remained dominant at 21.37%, showing a slight decrease compared to 2021. However, the social and labor relations component declined from 20.28% to 17.66%. At the same time, demographic security increased sharply from 16.93% to 20.30%, indicating rising concerns over population outflow and migration. For Chernivtsi Oblast, demographic security remained consistently high (22.12% in both 2015 and 2023) holding the leading position among all components. The social and labor relations component fell from 17.69% to 15.41%, while environmental security decreased from 16.63% to 14.48%. Food security remained nearly unchanged at 15.58%.

Thus, in 2023, the most notable transformations were the increased significance of demographic and environmental security, as well as quality of life, while the institutional component (social and labor relations) partially lost its weight. These shifts reflect the adaptive mechanisms of territorial communities under prolonged wartime conditions, demographic vulnerability, and the pressing need to sustain basic living conditions.

According to the results of the study, in 2010-2022, Zakarpatska oblast was in the range below social vulnerability, i.e. the loss of resilience to risks and threats. The value of the empirical indicator of social resilience was the lowest (0.391) in 2014, which is 25.9 pp lower than in 2013. In 2017-2020, the trend of increasing social vulnerability was downward, but in 2021, the empirical indicator decreased by 4.7 pp (Figure 2). The deviation of the social resilience coefficient from the lower marginal threshold ranged from -0.209 to -0.086 (Table 1). The average social resilience indicator for Zakarpatska oblast in 2010-2023 was 0.489, which is 11.1 pp and 51.1 pp less than the lower and upper marginal thresholds, respectively, and 21.4 pp and 34.7 pp less than the lower and upper optimal thresholds, respectively.

Table 1. Deviation of the current values of the composite index of social resilience from the vector of threshold values: social vulnerability aspect, 2010-2023

Thre-sholds	Oblasts	Years													
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Lower marginal	Zk	-0.092	-0.086	-0.098	-0.073	-0.209	-0.077	-0.101	-0.149	-0.133	-0.114	-0.089	-0.113	-0.174	-0.145
	Iv-Fr	-0.127	-0.110	-0.107	-0.096	-0.075	-0.125	-0.139	-0.107	-0.079	-0.087	-0.102	-0.032	-0.104	-0.069
	Lv	-0.148	-0.099	-0.153	-0.154	-0.095	-0.076	-0.099	-0.086	-0.119	-0.084	-0.073	-0.083	-0.148	-0.117
	Ch	-0.115	-0.096	-0.151	-0.080	-0.053	-0.059	-0.044	-0.092	-0.089	-0.095	-0.139	-0.085	-0.150	-0.119
Upper marginal	Zk	-0.492	-0.486	-0.498	-0.472	-0.609	-0.476	-0.501	-0.549	-0.533	-0.514	-0.488	-0.512	-0.574	-0.544
	Iv-Fr	-0.526	-0.509	-0.506	-0.496	-0.475	-0.525	-0.538	-0.507	-0.479	-0.487	-0.501	-0.432	-0.503	-0.469
	Lv	-0.548	-0.499	-0.552	-0.553	-0.495	-0.476	-0.499	-0.486	-0.519	-0.484	-0.473	-0.482	-0.547	-0.516
	Ch	-0.514	-0.496	-0.550	-0.479	-0.453	-0.459	-0.444	-0.491	-0.489	-0.494	-0.539	-0.485	-0.549	-0.518
Lower optimal	Zk	-0.195	-0.189	-0.201	-0.175	-0.312	-0.179	-0.204	-0.252	-0.236	-0.217	-0.191	-0.215	-0.277	-0.247
	Iv-Fr	-0.229	-0.212	-0.209	-0.199	-0.178	-0.228	-0.241	-0.210	-0.182	-0.190	-0.205	-0.135	-0.206	-0.172
	Lv	-0.251	-0.202	-0.255	-0.256	-0.198	-0.179	-0.202	-0.189	-0.222	-0.187	-0.176	-0.185	-0.250	-0.219
	Ch	-0.217	-0.199	-0.253	-0.182	-0.156	-0.162	-0.147	-0.194	-0.192	-0.197	-0.242	-0.188	-0.252	-0.221
Upper optimal	Zk	-0.328	-0.322	-0.334	-0.308	-0.445	-0.312	-0.337	-0.385	-0.369	-0.350	-0.324	-0.348	-0.410	-0.380
	Iv-Fr	-0.362	-0.345	-0.342	-0.332	-0.311	-0.361	-0.374	-0.343	-0.315	-0.323	-0.337	-0.268	-0.339	-0.305
	Lv	-0.384	-0.335	-0.388	-0.389	-0.331	-0.312	-0.335	-0.322	-0.355	-0.320	-0.309	-0.318	-0.383	-0.352
	Ch	-0.350	-0.332	-0.386	-0.315	-0.289	-0.295	-0.280	-0.327	-0.325	-0.330	-0.375	-0.321	-0.385	-0.354

Note: Zk – Zakarpatska; Iv-Fr – Ivano-Frankivska; Lv – Lvivska; Ch – Chernivetska.
Source: compiled based on the authors' calculations

The levels of social resilience in Ivano-Frankivska oblast were similarly below the marginal threshold, indicating the social vulnerability of the population in 2010-2023. In 2013-2014 and 2018-2019, the territory balanced at the level of the lower marginal threshold, with deviations of -0.085 and -0.081 respectively. The critical weakening of social resilience in the region was observed in 2010 (0.474), 2015 (0.475), and 2016 (0.462), which is 12.7 pp, 12.5 pp, and 13.9 pp below the lower marginal threshold, respectively. Over the period under

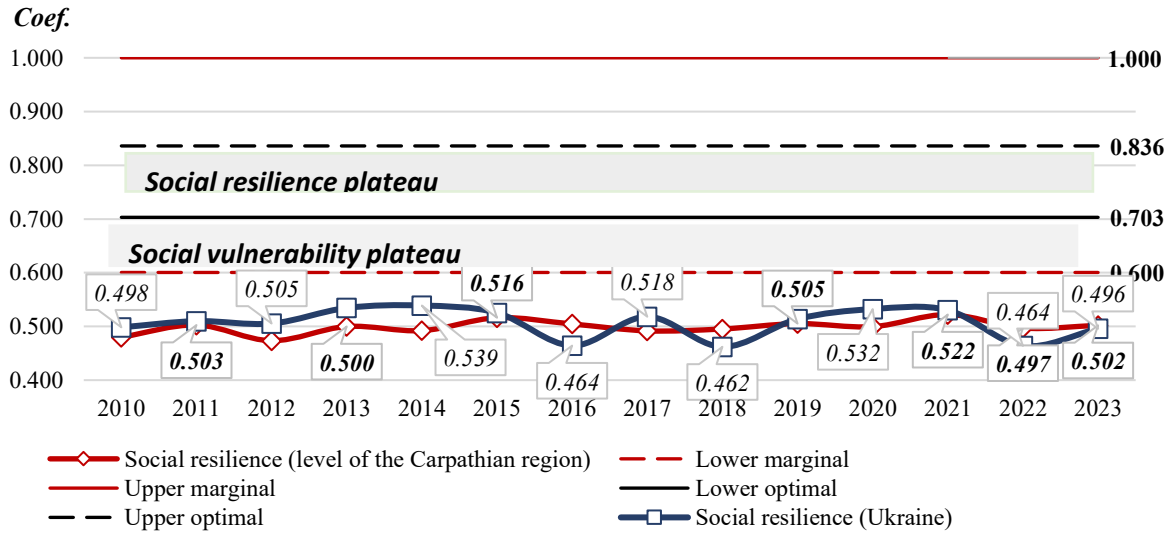
study, the average value of the empirical indicator of social resilience in Ivano-Frankivska oblast was 0.502, which is 9.9 and 49.8 pp less than the lower and upper marginal thresholds, respectively, and 20.2 and 33.4 pp less than the lower and upper optimal thresholds.

Compared to other oblasts of the Carpathian region of Ukraine, Lvivska oblast demonstrated a steady trend towards increased social resilience in 2010-2023, apart from 2012-2013 (0.447-0.448) and 2018 (0.481). The average value of the empirical indicator of social resilience in Lvivska oblast was 0.495, which is 10.6 pp and 50.5 pp below the upper and lower marginal thresholds, respectively, and 20.8 pp and 34.1 pp below the lower and upper optimal thresholds. For comparison, the empirical indicator of social resilience in Lvivska oblast in 2020 was 0.527, which is 2.8 and 1.5 pp higher than in Ivano-Frankivska and Zakarpatska oblasts, respectively.

Chernivetska oblast demonstrated the least deviations (0.92 pp) of the average social resilience indicator (0.509) from the lower marginal threshold among the oblasts of the Carpathian region. The range of deviations from the optimal thresholds was from 19.4 pp to 32.7 pp. A significant increase in social vulnerability in Chernivetska oblast was observed in 2012 (the deviation from the lower marginal value was -0.151), in 2017 (-0.092), and in 2020 (-0.139). Interestingly, Chernivetska oblast had critically low values of social resilience during the study period, indicating a loss of the region's resistance to macroeconomic instability and financial and economic risks, which led to an increase in social vulnerability, especially in terms of poverty and limited access to social goods and services.

Over the period 2021–2023, the Carpathian region of Ukraine exhibited a general trend of decreasing social vulnerability across all studied oblasts. Specifically, in Zakarpattia Oblast, the deviation of the composite social resilience index from the lower threshold deteriorated in 2022 (–0.174). A similar trend is observed for the upper threshold (from -0.574 in 2022 to -0.544 in 2023), as well as for the lower (from -0.277 to -0.247) and upper optimal thresholds (from -0.410 to -0.380), indicating a moderate reduction in social vulnerability. Ivano-Frankivsk Oblast demonstrated a slight strengthening of social resilience (Fig. 2). Although the indicators in Lviv Oblast remained within the vulnerability zone, the trend points to a gradual decrease in social vulnerability (the lower marginal deviation decreased from -0.148 in 2022 to -0.117 in 2023). Similar trends are observed in Chernivtsi Oblast, notably the decrease of the lower marginal deviation from -0.150 to -0.119 and the upper optimal deviation from -0.385 to -0.354. In 2022, a significant decrease in both indicators was observed (to 0.497 for the Carpathian region and to 0.464 for Ukraine). In 2023, a certain recovery of social resilience was noted, with the index for the Carpathian region increasing to 0.502.

Figure 2. Social resilience – social vulnerability plateau for Ukraine and the Carpathian region, 2010-2023: a compositional approach



Source: compiled based on the authors' calculations

In 2010-2023, the oblasts of the Carpathian region demonstrated a critical situation of social vulnerability of the population with a tendency to approach the lower marginal threshold. Declining living standards, disruption of the demographic balance, and poor quality of the social and labor sphere are the main triggers for the spread of social vulnerability and, consequently, the weakening of social resilience. Thus, during 2010-2023, Ukraine as a whole and the Carpathian region were in the zone of social vulnerability with an average value of 0.511 and

0.499, respectively. In 2010-2015, the trend of social resilience in the Carpathian region mirrors the national trend, with the highest value of the divergence indicator observed in 2010 (3.2 pp) and the lowest in 2010 (0.9 pp). In 2016 and 2018, the Carpathian region demonstrated higher empirical indicators of social vulnerability compared to the national indicators (4.0 pp and 3.3 pp, respectively). This trend seems to be natural, as the level of socio-economic development of the Carpathian region of Ukraine is defined as moderate compared to other economic regions of Ukraine. For example, the average GRP per capita in the Carpathian region of Ukraine in 2018 was over UAH 56,400, while Chernivetska oblast had one of the lowest figures in Ukraine (UAH 37,400). Despite the positive trend in the growth of socio-economic development indicators, the GRP of the Carpathian region was about 67% of the national average.

It is worth mentioning that the volume of capital investments in environmental protection characterized by permanent dynamics in 2016-2023 is the conceptual trigger for the increase in the divergence of indicators, for example, of the socio-ecological resilience of the Carpathian region from the national average. There was a significant increase in capital investments in Ukraine in 2019 compared to 2018 by UAH 6.2 billion or 61.4%; while in the Carpathian region, capital investments decreased by UAH 131.2 million or 20.4%. Chernivetska and Zakarpatska oblasts were characterized by a relatively low level of investment in general throughout the study period.

4. Discussions

Ensuring migration security in the system of socio-economic resilience of the territory has a complementary methodological and practical significance, which is associated with the unique characteristics of migration processes as an object of the regulation (*e.g.*, volume, dynamics, risks for structural transformation of the economy, migration transfers, and entrepreneurial capital) and variability of the relationship between the structural characteristics of migration and the parameters of economic security, resilience, and development.

Within the framework of migration policy, the issues of the impact of migration on the economic system are not complex, dynamic, or multidimensional. In the state migration management policy, migration security is regulated in the projection of national economic development or ensuring economic resilience. Meanwhile, the migration security policy envisages the management of migration processes in such a way that their volumes are within the optimal range, exceeding which has negative consequences for the economic system and national security. It is worth distinguishing three blocks of mechanisms for ensuring migration security – (1) economic security, (2) socio-economic resilience, and (3) economic growth.

Mechanisms for ensuring migration security within the economic security block include detailed measures to counteract the decline in business activity and investment attractiveness of the territory because of macroeconomic shocks, deterioration of the business environment, etc. A set of instruments aims to regulate the pressure on the social system and infrastructure (Jia *et al.* 2022), develop a balanced labor market (Levytska *et al.* 2022), eliminate demographic imbalances, reduce social inequality (Mulska *et al.* 2023b), preserve human resources, develop human capital (Voznyak *et al.* 2021), and stabilize the financial system (Wielechowski *et al.* 2021).

Maximizing the effectiveness of the use of migration potential for the sake of ensuring the resilience of the socio-economic system is the main objective of the development and implementation of migration security mechanisms in the socio-economic resilience block. Mechanisms for the regulation of migration flows focus on ensuring economic stability through: development and enhancement of labor market competitiveness (attracting highly qualified labor force with necessary professional skills; identifying and filling labor shortages in certain industries or regions; responding to 'staff shortages' as a result of external migration depending on labor market needs; attracting highly qualified specialists) (Mulska *et al.* 2023a), increase in the attractiveness and stimulation of investment activity in the business sector (creation of new jobs, provision of benefits and various forms of support for migrant entrepreneurs) (Andersson & Siegel, 2020), the impact of migration on development, prevention of illegal migration (strengthening border control to reduce the illegal movement of people, introduction of severe penalties for illegal employment), adaptation of regional economic policy to market turbulence (Ilyash *et al.* 2022; Alpaslan *et al.* 2021), long-term monitoring of the economic situation, and adaptation of migration policy to new challenges and opportunities (Lupak *et al.* 2022).

The mechanisms of ensuring migration security in the economic growth block focus on increasing the competitiveness of the economic system, expanding factors, increasing production resources (capital, labor, innovations, technologies, intangible assets, entrepreneurial skills, business models), improving the structure of the economy through the development of high-tech industries, sectors with significant added value, and productive areas, and developing rational balances between the private and public and commercial and non-profit

sectors. Reducing regional disparities and optimizing the pace of demographic reproduction processes in the context of the migration crisis are triggers of economic development, the increase of the potential for economic recovery, and the reduction of the effects of economic stagnation (Voznyak *et al.* 2024).

The systematization of scientific approaches to the development of mechanisms for ensuring migration security as regulatory tools ensuring the controlled course of migration processes, contributes to the construction of a conceptual model of mechanisms in the projection of their ability to secure the dynamic resilience of the socio-economic system. According to the author's interpretation, the mechanisms for ensuring migration security include measures of state and local authorities to influence migration, its volume, and structural characteristics to minimize its negative impact on the security, resilience, and development of the socio-economic system. Interestingly, the current mechanisms for ensuring migration security focus on regulating migration in the context of economic security, medium-term mechanisms – on socio-economic resilience, and long-term mechanisms – on economic development. The differentiation of the mechanisms involves specifying the functions, principles, methods, and means of implementing state and regional migration and economic policies, as well as opportunities to use the potential of migration, ensuring its controllability in the security – resilience –economic growth vector.

The process of implementing migration security mechanisms depends on certain elements of the basis, in particular (1) legislative regulation (laws and regulations governing migration processes, including immigration codes, legal acts defining the rights and obligations of migrants, and rules for controlling migration flows); (2) controlling (control and monitoring) (databases, electronic identification systems, etc.); (3) international cooperation (cooperation between countries and international organizations to share information, respond to migration challenges, and coordinate security efforts); (4) HR management (training, advanced training of specialists of border and migration services); (5) risk analysis and foresight (long-term implementation of risk management, development of strategies to minimize the consequences, forecasting possible threats, and preparation for possible scenarios); (6) social and legal security of migrants (providing legal assistance and social support to migrants in difficult situations or victims of exploitation to ensure their rights and integration into society). The configuration of these elements forms the basis for the implementation of mechanisms and a comprehensive system of migration security, which contributes to the effective management of migration processes and the protection of national and migrant interests.

Conclusions and Further Research

The study confirms the hypothesis: migration security is a determinant of the country's socio-economic resilience, and its weakening is determined by a critical increase in social vulnerability, which has a permanent reverse effect on the Ukrainian economy and society in the long run.

Social vulnerability is examined from the perspective of social resilience and determining the boundaries of the system's safe existence. The calculation of thresholds of catalysts, regressors, and components was the conceptual stage of the study, which helped determining 'vulnerability zones' and 'safety margin' ranges by comparing them with the composite coefficients. Threshold vectors (lower marginal – upper marginal; lower optimal – upper optimal) are defined for each component of social resilience.

Based on the temporal-spatial approach and using the multiplicative method, a series of empirical indicators of social resilience is constructed for the oblasts of the Carpathian region of Ukraine. The study reveals that in 2010-2023, the region's oblasts demonstrated a critical situation of social vulnerability of the population with a tendency to approach the lower marginal threshold (the indicator in the Carpathian region of Ukraine was 0.499). The main triggers for the spread of social vulnerability, and thus the weakening of social resilience, included a decline in the standard of living, disruption of the demographic balance, and the poor quality of the social and labor sphere. In 2010-2015, the trend of ensuring social resilience in the Carpathian region reproduced to the national one, with the highest value of the divergence indicator in 2010 (3.2 pp) and the lowest in 2020 (0.9 pp).

The practical value of the authors' methodology for studying the vulnerability-resilience of the socio-economic system is determined by the identification of the dynamics of the composite social resilience coefficients and their deviations from the thresholds as an empirical indicator of social vulnerability. Such an approach leads to the implementation of adaptive and proactive actions and makes it possible to scientifically substantiate the strategic guidelines for indicators of strengthening social resilience, while also reducing social vulnerability in the context of the migration crisis. The testing of this approach resulted in a scientific justification of the need to regulate key indicators that ensure social resilience at an optimal level and form the basis of a proactive policy to reduce social vulnerability.

The scientific novelty of the study lies in the development and testing of a scientific and methodological approach to assessing the social vulnerability of the population through the identification of vulnerability (risk) zones, resilience reserves, and the social resilience of a territory. This approach is based on the concept of dynamic equilibrium ('homeostasis') and has enabled the identification of threshold, optimal, and critical values of catalysts and regressors across various social domains (such as the quality of socio-labor relations, living standards, quality of life, and demographic, environmental, and food security). It also determines the degree of influence of specific indicators on ensuring social stability (reducing social vulnerability) and assesses the capacity of the social system to maintain resilience over time and to withstand emerging challenges and threats.

The study of social vulnerability is important in terms of determining the boundaries of safe system functioning or identifying the degree of social resilience. A key conceptual stage of the research was the calculation of threshold values for catalysts, regressors, and components, which made it possible, through comparison with compositional coefficients, to identify 'vulnerability zones' and ranges of 'resilience reserves.

Meanwhile, special attention is paid to the limitations of the methodological approach to assessing social vulnerability in the projection of the resilience of the socio-economic system:

1) vulnerability indicators are selected and grouped using an expert method and are subject to discussion regarding their decomposition;
2) the division of indicators into catalysts and regressors is subject to discussion;
3) the boundaries of the marginal and optimal ranges of indicators are permanent during the study period, which does not fully reflect the cyclical and dynamic nature of socio-economic processes.

Further research is modeling the complementary causal relationship between socio-economic resilience and migration security and identifying the delayed impact of determinants on the potential for recovery of territories in conditions of instability.

Credit Authorship Contribution Statement

Authors have contributed equally to this research.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Use of Generative AI and AI-Assisted Technologies

The authors declare that they have not used generative AI and AI-assisted technologies in the writing process before submission.

References

[1] Aldrich, D. P., & Meyer, M. A. (2014). Social Capital and Community Resilience. *American Behavioral Scientist*, 59(2): 254-269. DOI: https://doi.org/10.1177/0002764214550299

[2] Alpaslan, B., *et al.* (2021). Economic Effects of Remittances on Migrants' Country of Origin. In: Kourtit, K., Newbold, B., Nijkamp, P., Partridge, M. (eds) The Economic Geography of Cross-Border Migration. Footprints of Regional Science. Springer, Cham. DOI: https://doi.org/10.1007/978-3-030-48291-6_20

[3] Andersson, L., & Siegel, M. (2020). The Impact of Migration on Development in Developing Countries: A Review of Empirical Literature. *Regional Integration and Migration Governance in the Global South,* 131-150. DOI: 10.1007/978-3-030-43942-2_6

[4] Angenendt, S. (2008). International Migration-Just a Matter of State Security? In J. Sommer, & A. Warnecke (Ed.), Brief 36 The Security- Migration Nexus: Challenges and Opportunities of African Migration to EU Countries (pp. 19-21).

[5] Arends, H., Herrmann, B., Brik, T., & Roesel, F. (2023). Ukraine's resilience: How an administrative reform boosted social capital and trust in Ukrainian communities. VoxEU Cepr. Retrieved from https://cepr.org/voxeu/columns/ukraines-resilience-how-administrative-reform-boosted-social-capital-and-trust

[6] Asl, S.R., Rahman, A., Tate, E. *et al.* (2025). Social vulnerability correlates of flood risk to crops and buildings. *Natural Hazards*, 121: 8137–8158. DOI: https://doi.org/10.1007/s11069-025-07137-y

[7] Balzacq, T., S. Léonard, & J. Ruzicka (2016). Securitization. *Revisited: Theory and Cases. International Relations*, 30: 494–531. DOI: 10.1177/0047117815596590

[8] Bello, V. (2022). The spiralling of the securisation of migration in the EU: From the management of a 'crisis' to a governance of human mobility? *Journal of Ethnic and Migration Studies*, 48: 1327–1344. DOI:10.1080/1369183X.2020.1851464

[9] Bloom, T. (2014) The business of migration control: Delegating migration control functions to private actors, *Global Policy*, 6: 151–157. DOI: https://doi.org/10.1111/1758-5899.12188

[10] Boiko, V., Mulska, O., Baranyak, I., & Levytska, O. (2021). Ukrainian migration aspirations towards Germany: Analysis and development scenarios. *Comparative Economic Research*, 24(1): 65-84. DOI: 10.18778/1508-2008.24.04

[11] Brauch, H.G. (2011). Concept of Security Threats, Challenges, Vulnerabilities and Risks. In H. G. Bauch, U. O. Spring, C. Mesjasz, J. Grin, P. Kameri-Mbote, B. Chourou, P. Dunay & J. Birkmann (Eds.), Coping with global environmental change, disaster and security. Berlin: Springer-Verlag Berlin Heindelberg.

[12] Cutter, S.L. (2024). The origin and diffusion of the social vulnerability index (SoVI). *International Journal of Disaster Risk Reduction*, 109. DOI: 10.1016/J.IJDRR.2024.104576

[13] De Roulet, P., Chenal, J., Munyaka, B.J.C., Pudasaini, U. (2024). Mapping rural mobility in the global south: case studies of participatory GIS approach for assessments of daily movement needs and practice in Nepal and Kenya. *Sustainability*, 16 (21): 9442. DOI: 10.3390/su16219442

[14] Diskaya, A. (2013). Towards a critical securitization theory: The Copenhagen and Aberystwyth schools of security studies. Retrieved from: http://www.e-ir.info/2013/02/01/towards-a-critical-securitization-theory-the-copenhagen-and-aberystwyth-schools-of-security-studies/

[15] Djafar, F. (2012). Dynamic of push and pull factors of migrant workers in developing countries: The case of Indonesian workers in Malaysia. *Journal of Economics and Behavioral Studies*, 4(12): 703-711. DOI:10.22610/jebs.v4i12.370

[16] Dmytryk O., Vasyltsiv T., Mulska O., Lupak R., Kunytska-Iliash M., & Dubyna M. (2024). Financial and economic security and development of priority sectors of the national economy ukraine: casual nexus empirical. *Financial and Credit Activity Problems of Theory and Practice*, 4(57): 301-316. DOI:https://doi.org/10.55643/fcaptp.4.57.2024.4443

[17] Drury, J., Carter, H., Cocking, C., Ntontis, E., Tekin Guven, S., & Amlôt, R. (2019). Facilitating collective psychosocial resilience in the public in emergencies: Twelve recommendations based on the social identity approach. *Frontiers in Public Health*, 7. DOI: https://doi.org/10.3389/fpubh.2019.00141

[18] Humphery, M. (2013). Migration, Security and Insecurity. *Journal of Intercultural Studies*, 34(2): 178-195. DOI: 10.1080/07256868.2013.781982

[19] Ilyash, O., Lupak, R., Kravchenko, M., Trofymenko, O., Duliaba, N., & Dzhadan, I. (2022). A forecasting model for assessing the influence of the components of technological growth on economic security. *Business: Theory and Practice*, 23(1): 175–186. DOI: https://doi.org/10.3846/btp.2022.15298

[20] Jia, N., Molloy, R., Smith, Ch., & Wozniak, A. (2022). The Economics of Internal Migration: Advances and Policy Questions, IZA Discussion Papers 15047, Institute of Labor Economics (IZA).

[21] Kaunert, C., & Léonard, S. (2021). Collective securitization and crisification of EU policy change: two decades of EU counterterrorism policy. *Global Affairs*, 7(5): 687–693. DOI:https://doi.org/10.1080/23340460.2021.2002098

[22] Keudel, O., & Huss, O. (2023). National security in local hands? How local authorities contribute to Ukraine's resilience (PONARS Eurasia Policy Memo No. 825). Retrieved from https://www.ponarseurasia.org/wp-content/uploads/2023/02/Pepm825_Keudel-Huss_Jan2023.pdf

[23] Léonard, S. (2010). EU border security and migration into the European Union: FRONTEX and securitisation through practices. *European Security*, 19 (2): 231–254. DOI: https://doi.org/10.1080/09662839.2010.526937

[24] Léonard, S., & Kaunert, C. (2020). The securitisation of migration in the European Union: Frontex and its evolving security practices, *Journal of Ethnic and Migration Studies*, 48 (6): 1417–1429. DOI:https://doi.org/10.1080/1369183X.2020.1851469

[25] Levytska, O., Mulska, O., Shushkova, Yu., Ivaniuk, U., Vasyltsiv, T., Krupin, V., & Ivanova, L. (2022). Modelling the impact of emigration upon social and economic development of the Carpathian region of Ukraine. *Bulletin of Geography. Socio-economic Series*, 57: 141-154. DOI: 10.12775/bgss-2022-0028

[26] Lupak, R., Mizyuk, B., Zaychenko, V., Kunytska-Iliash, M., & Vasyltsiv, T. (2022). Migration processes and socio-economic development: interactions and regulatory policy. *Agricultural and Resource Economics: International Scientific E-Journal*, 8(1): 70–88. DOI: https://doi.org/10.51599/are.2022.08.01.04

[27] Magis, K. (2010). Community resilience: An indicator of social sustainability. *Society & Natural Resources*, 23(5): 401-416. DOI: https://doi.org/10.1080/08941920903305674

[28] Metelev, S. (2016). Migration as a Threat to National Security. *Indian Journal of Science and Technology*, 9(14): 1-6. DOI: 10.17485/ijst/2016/v9i14/91086

[29] Molnár, A., & Vecsey, M. (2022). The EU's missions and operations from the central Mediterranean to West Africa in the context of the migration crisis. *International Journal of Euro-Mediterranean Studies*, 15(1): 55–982. Available at: https://ijems.emuni.si/index.php/home/article/view/22

[30] Mulska O., Vasyltsiv T., Kunytska-Iliash M., & Baranyak I. (2023a). Innovative Empirics of Migration-economic Security Causal Nexus. *Science and Innovation*, 19(3): 48-64. DOI:https://doi.org/10.15407/scine19.03.048

[31] Mulska O., Vasyltsiv T., Shushkova Yu., Kloba L., & Parfenyuk Ye. (2022). Assessment of the population's social resilience environment (the case of the Carpathian region of Ukraine). *Problems and Perspectives in Management*, 2022, 20(1): 407-421. DOI:10.21511/ppm.20(1).2022.33

[32] Mulska, O., Vasyltsiv, T., Mitsenko, N., Ivaniuk, U., & Lekh-Debera, A. (2023b). Conservation of rural human resources in Ukraine: modelling the relationship between migration and economic development. *Agricultural and Resource Economics: International Scientific E-Journal*, 9(4): 79-101. DOI:https://doi.org/10.51599/are.2023.09.04.04

[33] Nebrat, V., Kurbet, O. (2025). Social vulnerability in the context of the historical heritage of paternalism. *Economy of Ukraine*, 68 (761): 90-108. DOI: https://doi.org/10.15407/economyukr.2025.04.090

[34] Panebianco, S. (2020). The EU and migration in the Mediterranean: EU borders' control by proxy. *Journal of Ethnic and Migration Studies*, 48: 1398–1416. DOI: https://doi.org/10.1080/1369183X.2020.1851468

[35] Parker, D., & Tapsell, S. (2009). Relations between different types of social and economic vulnerability. Final draft report submitted to EU project Enhancing resilience of communities and territories facing- natural and na-tech hazards (ENSURE).

[36] Pfefferbaum, B., Van Horn, R. L., & Pfefferbaum, R. L. (2017). A conceptual framework to enhance community resilience using social capital. *Clinical Social Work Journal*, 45(2): 102-110. DOI: https://doi.org/10.1007/s10615-015-0556-z

[37] Podgórzanska, R. (2019). The issue of securitization of the Refugee: Problem in the polish political debate. *Polish Political Science Yearbook*, 48(1): 67–89. DOI: 10.15804/ppsy2019104

[38] Roy, S., Bose, A., Basak, D., Chowdhury, I.R. (2024). Towards sustainable society: the sustainable livelihood security (SLS) approach for prioritizing development and understanding sustainability: an insight from West Bengal, India. *Environment, Development and Sustainability*, 26. DOI: 10.1007/s10668-023-03456-x

[39] Shepherd, A. (2021). EU counterterrorism, collective securitization, and the internal-external security nexus. *Global Affairs*, 7: 733–749. DOI: https://doi.org/10.1080/23340460.2021.2001958

[40] Shubalyi, O., & Gordiichuk, A. (2022). The socio-economic consequences of the war in Ukraine: the national, regional, and global dimensions. *Regional Barometer. Analyses & Prognoses*, 18(1). DOI: 10.56583/br.721

[41] Sperling, J., & M. Webber. (2019). The European Union: Security Governance and Collective Securitisation. *West European Politics*, 42: 228-260. DOI:10.1080/01402382.2018.1510193

[42] Subham, R., Suranjan, M., Arghadeep, B., & Indrajit R.Ch. (2024). Mapping the vulnerable: A framework for analyzing urban social vulnerability and its societal impact. *Societal Impacts*, 3. DOI:https://doi.org/10.1016/j.socimp.2024.100049

[43] Sundqvist, P. A. (2025). Household-level flood social vulnerability index in Malawi: exploring the intersection between farming and non-farming households. *Natural Hazards*, 121. DOI: 10.1007/s11069-025-07280-6

[44] Syrtseva, S., Ivaniuk, U., Fedotova, I., Hurina, O., Dovzhyk, O., & Nazarenko, O. (2022). Innovative potential and development of Ukrainian small enterprises during the war (2022-2023). *Revista Amazonia Investiga*, 11(58): 222-232. DOI: https://doi.org/10.34069/AI/2022.58.10.24

[45] Tamasauskiene, Z., & Žičkienė, S. (2021). An investigation of the nexus between globalization dimensions and income inequality. Entrepreneurial *Business and Economics Review*, 9(2): 39-53. DOI:https://doi.org/10.15678/EBER.2021.090203

[46] Umukoro, N. (2016). Thermodynamics: Application of its principles to the effects of cross-border migration and Boko Haram crisis on security challenges in Africa. *Journal of Applied Security Research*, 11(1): 44-60. DOI: 10.1080/19361610.2016.1104279

[47] Vasyltsiv T., Lupak R., Mulska O., Levytska O., & Baranyak I. (2024). Youth migration during war: Triggers of positive aspirations and preservation of human resources in Ukraine. *Problems and Perspectives in Management*, 22(2): 627-641. DOI: 10.21511/ppm.22(2).2024.49

[48] Vasyltsiv T., Mulska O., Osinska O., & Makhonyuk O. (2022). Social and economic development of Ukraine: Modelling the migration factor impact. *Economics and Business Review*, 8 (22). DOI:10.18559/ebr.2022.3

[49] Vezovnik, A. (2018). Securitizing Migration in Slovenia: a discourse analysis of the slovenian refugee situation. *Journal of Immigrant & Refugee Studies*, 16: 39–56. DOI:10.1080/15562948.2017.1282576

[50] Viana, J.A.L., *et al.* (2025). Vulnerability to social engineering across digital user generations: a dual-theory approach. *Security Journal*, 38 (50). DOI: https://doi.org/10.1057/s41284-025-00498-w

[51] Voznyak H., Mulska O., & Bil M. (2021). Migration aspirations of territory population: A case study of Ukraine. *Problems and Perspectives in Management*, 19(2): 217-231. DOI:10.21511/ppm.19(2).2021.18

[52] Voznyak H., Storonyanska I., Mulska O., Patytska Kh., & Kaspshyshak A. (2024). Challenges of ensuring the integration of internally displaced persons into host communities: Behavioral determinants. *Problems and Perspectives in Management*, 22(3): 14-26. DOI: 10.21511/ppm.22(3).2024.02

[53] Wielechowski, M., Cherevyk, D., Czech, K., Kotyza, P., Grzęda, Ł., & Smutka, L. (2021). Interdependence between human capital determinants and economic development: K-means regional clustering approach for Czechia and Poland. *Entrepreneurial Business and Economics Review*, 9(4): 173-194. DOI:https://doi.org/10.15678/EBER.2021.090411

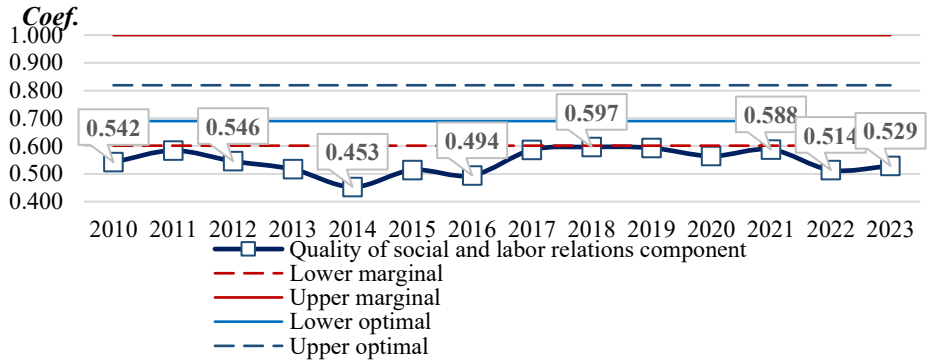
[54] Williams, M. C. (2003). Words, images, enemies: Securitization and international politics. *International Studies Quarterly*, 47: 511–531. DOI: https://doi.org/10.1046/j.0020-8833.2003.00277.x

[55] Yoon, D. K. (2012). Assessment of social vulnerability to natural disasters: a comparative study. *Natural Hazards*, 63(2): 823-843. DOI: https://doi.org/10.1007/s11069-012-0189-2

[56] Zahran, S., Brody, S. D., Peacock, W. G., Vedlitz, A., & Grover, H. (2008). Social vulnerability and the natural and built environment: a model of flood causalities in Texas. *Disasters*, 32(4): 537-560. DOI:https://doi.org/10.1111/j.1467-7717.2008.01054.x

[57] Zou, Le-Le, & Yi-Ming W. (2010). Driving factors for social vulnerability to coastal hazards in Southeast Asia: results from the meta-analysis. *Natural Hazards*, 54(3): 901-929. DOI: 10.1007/s11069-010-9513-x

Application 1. Social resilience – vulnerability of Zakarpatska oblast, 2010-2023: a structural and temporal approach



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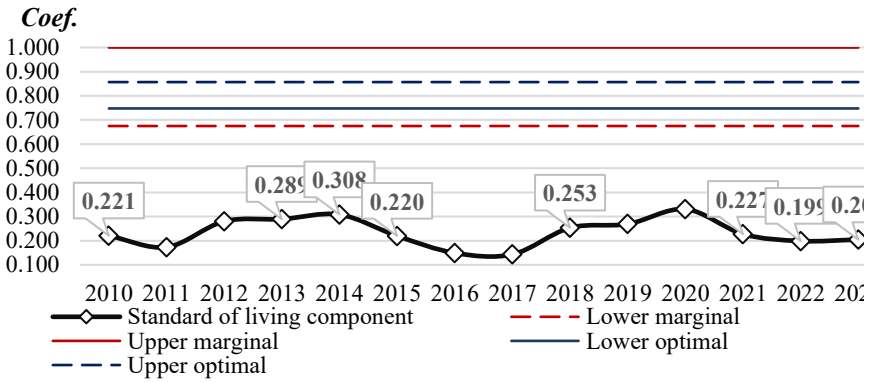
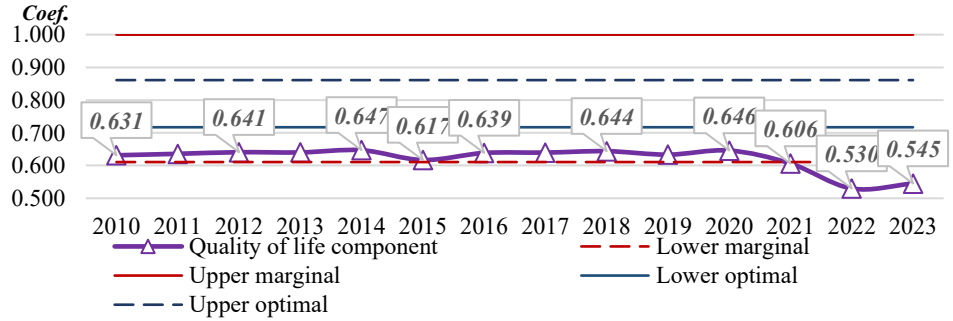


b) Standard of living component



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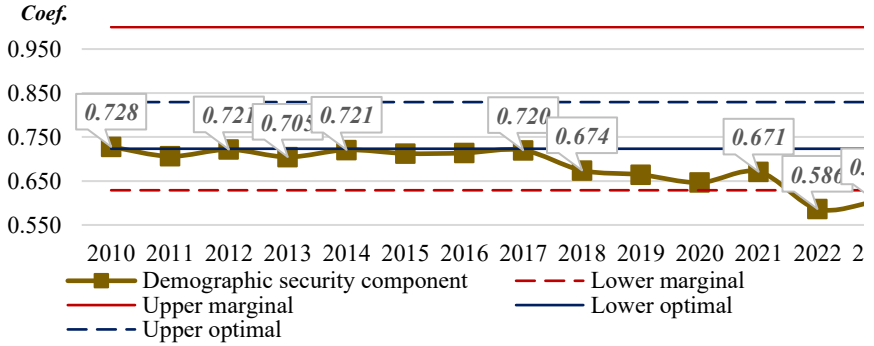
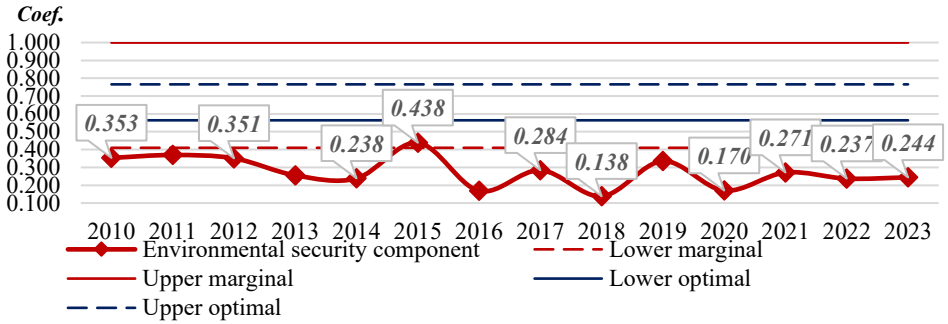


d) Demographic security component



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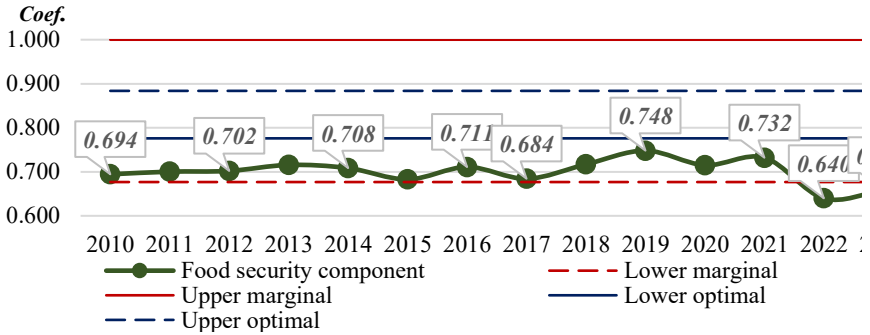
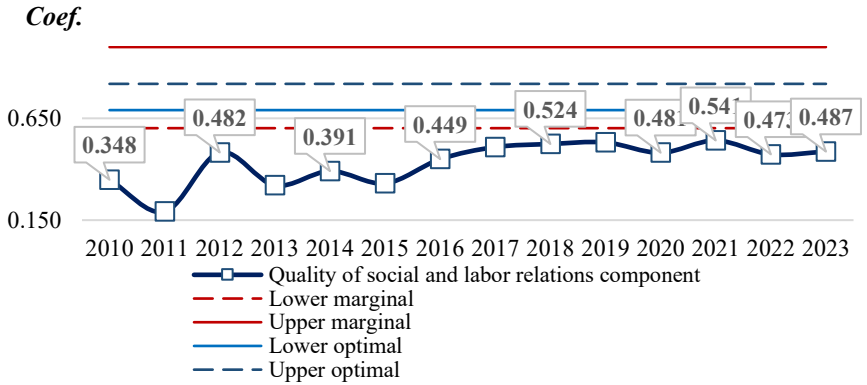


f) Food security component

Application 2. Social resilience – vulnerability of *Ivano-Frankivska oblast*, 2010-2023: a structural and temporal approach



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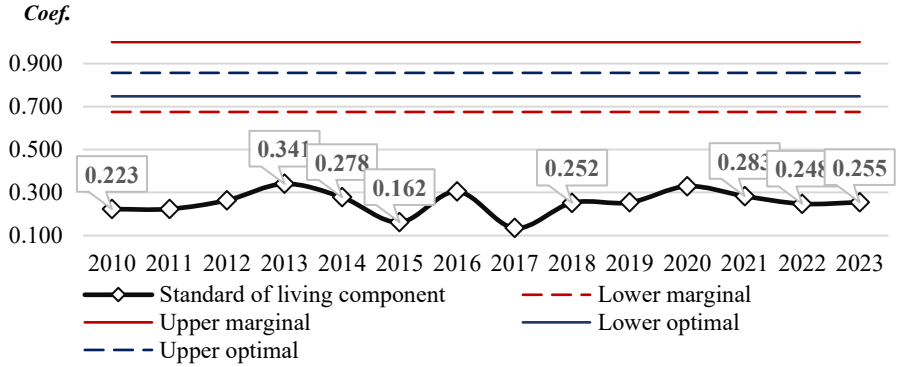

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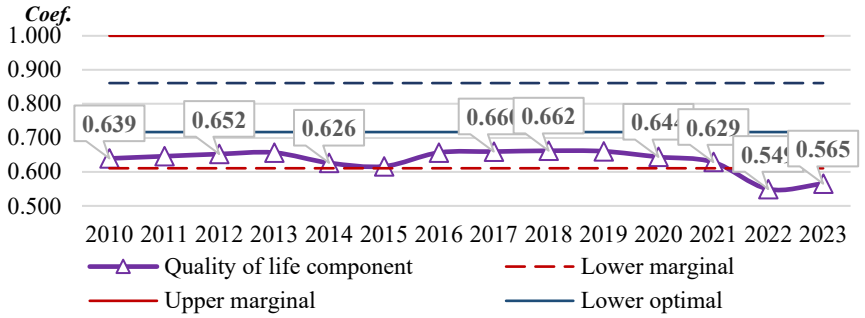

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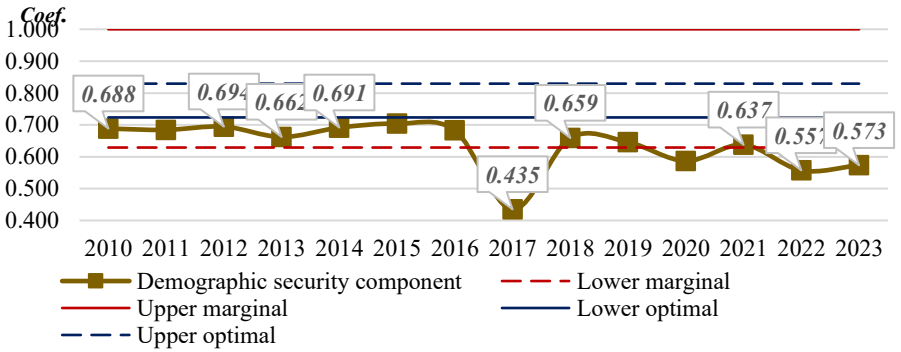

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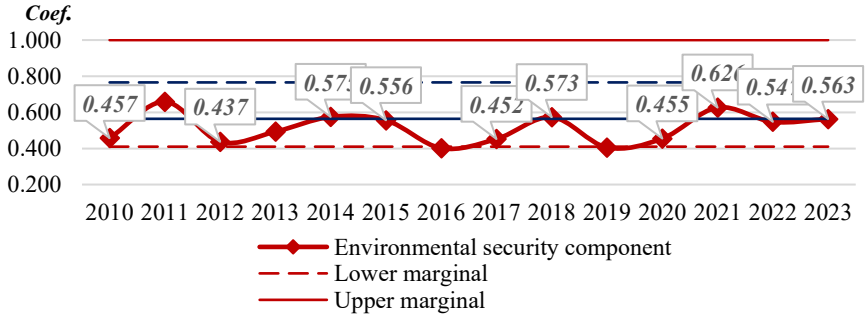

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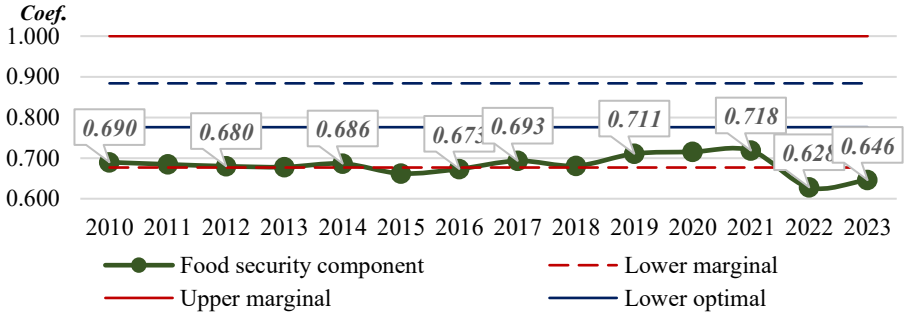
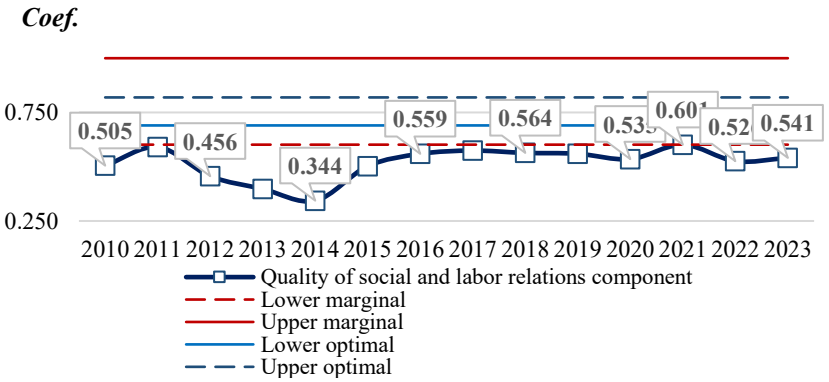


f) Food security component

Application 3. Social resilience – vulnerability of *Lvivska oblast*, 2010-2023: a structural and temporal approach



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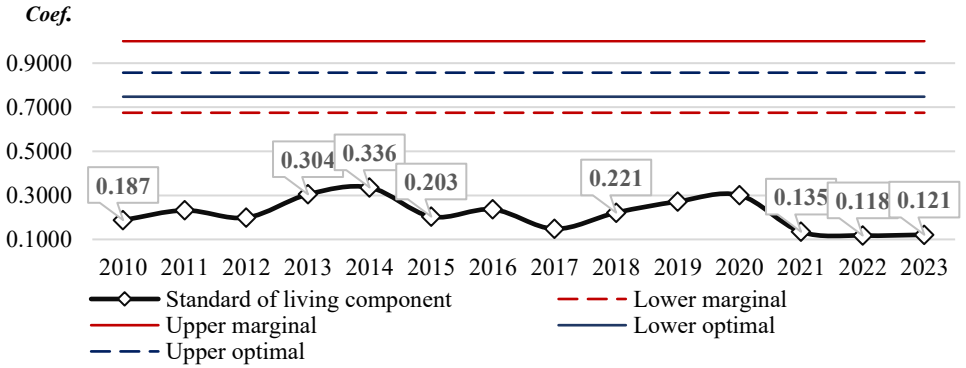

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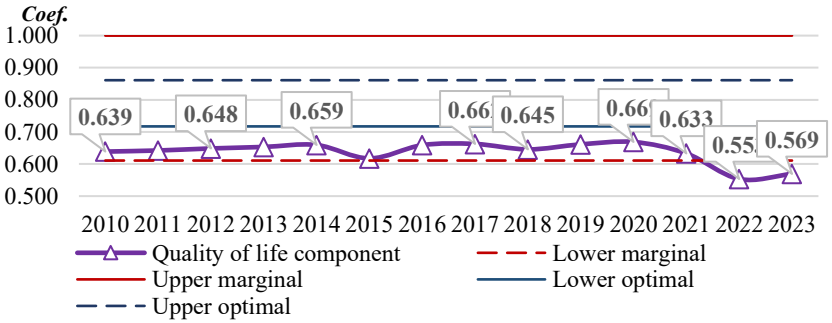

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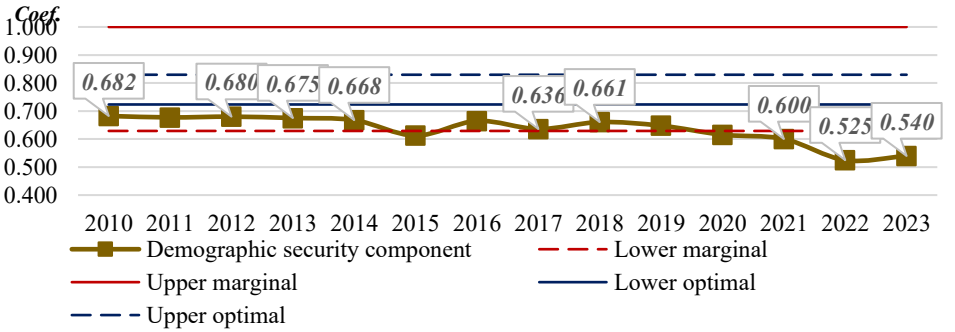

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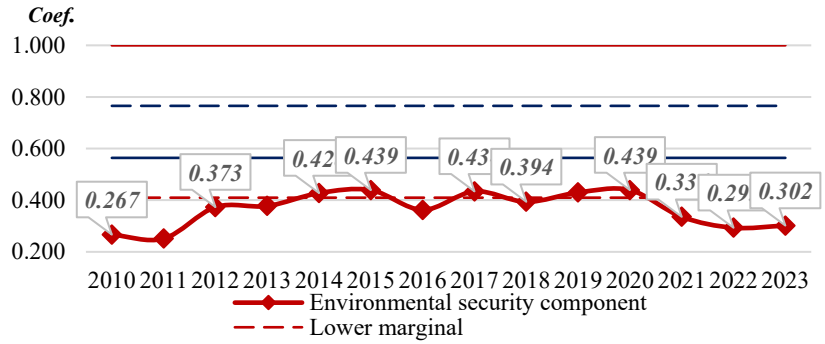

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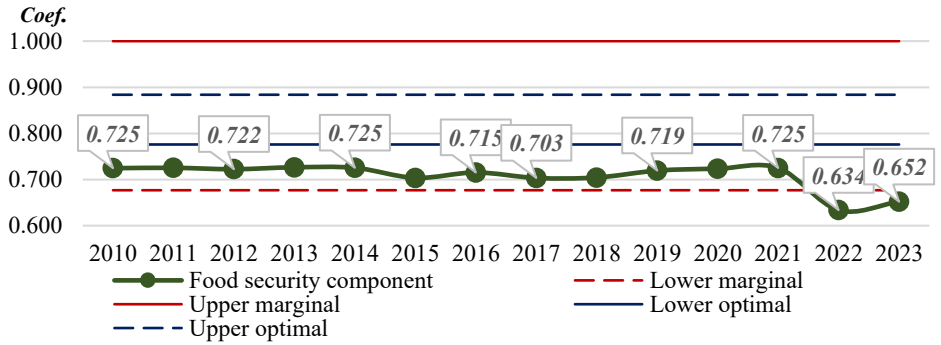
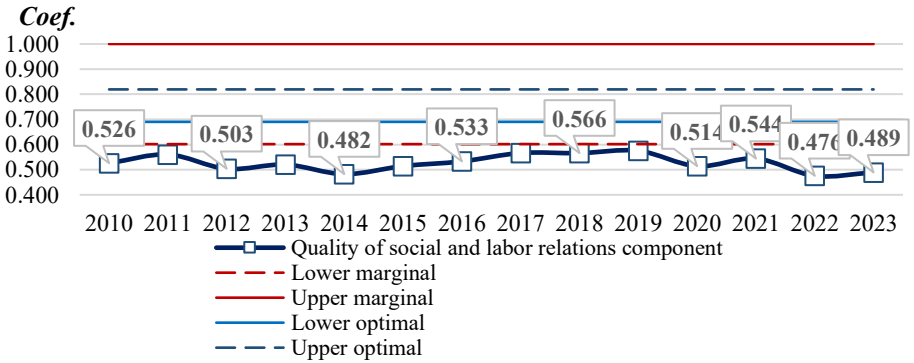
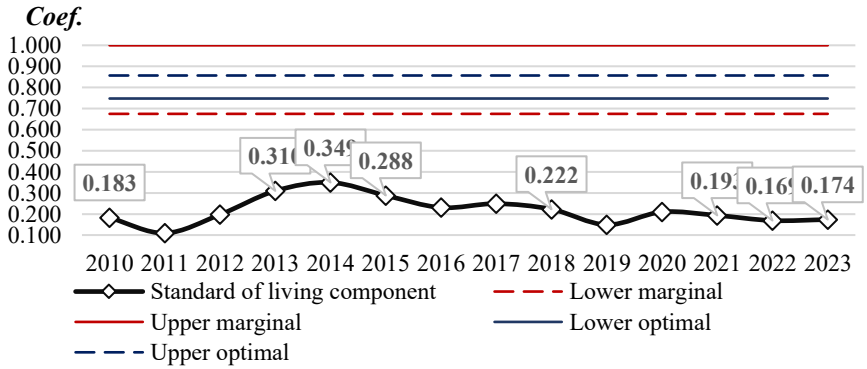


f) Food security component

Application 4. Social resilience – vulnerability of Chernivetska oblast, 2010-2023: a structural and temporal approach



a) Quality of social and labor relations component



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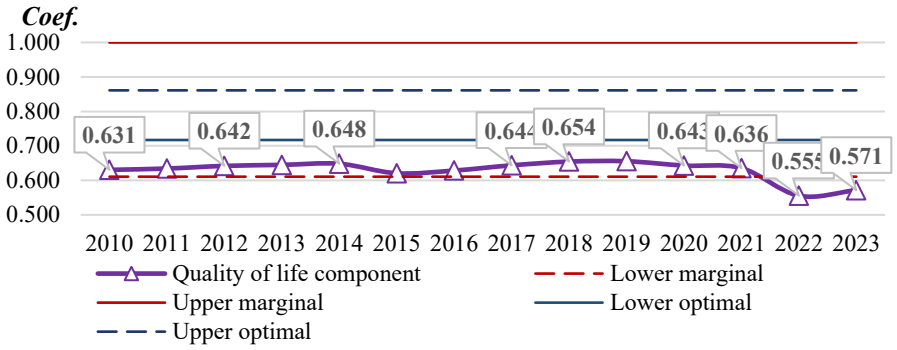

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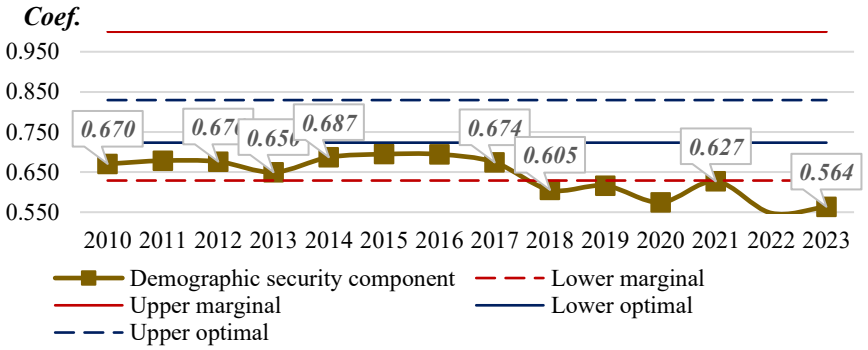

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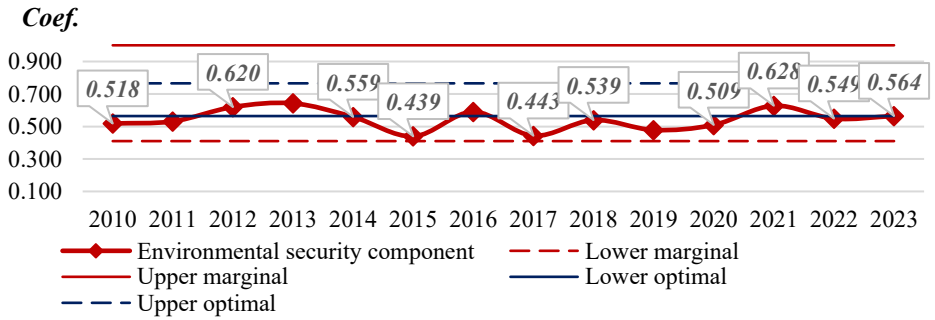

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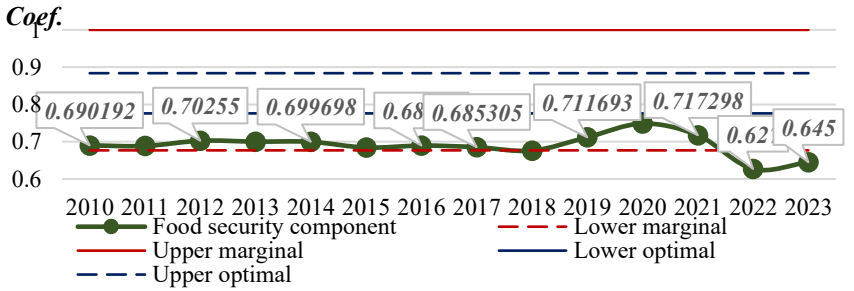
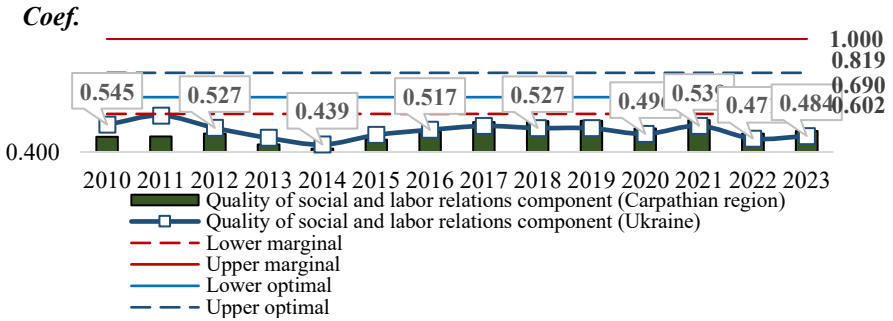


f) Food security component

Application 5. Social resilience – vulnerability of *Ukraine and the Carpathian region*, 2010-2023: a structural and temporal approach



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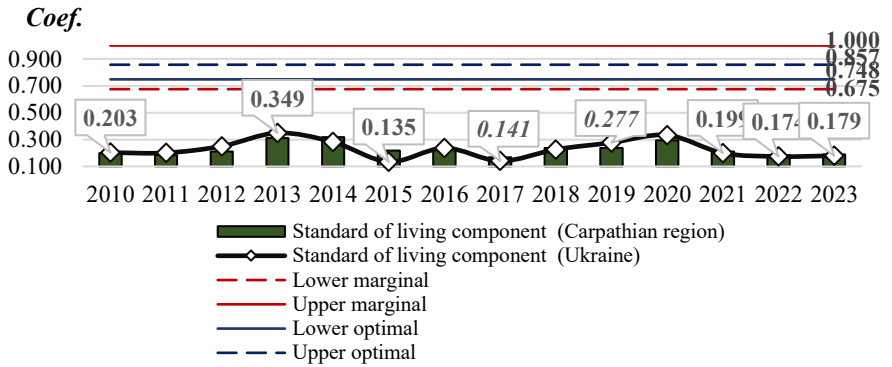

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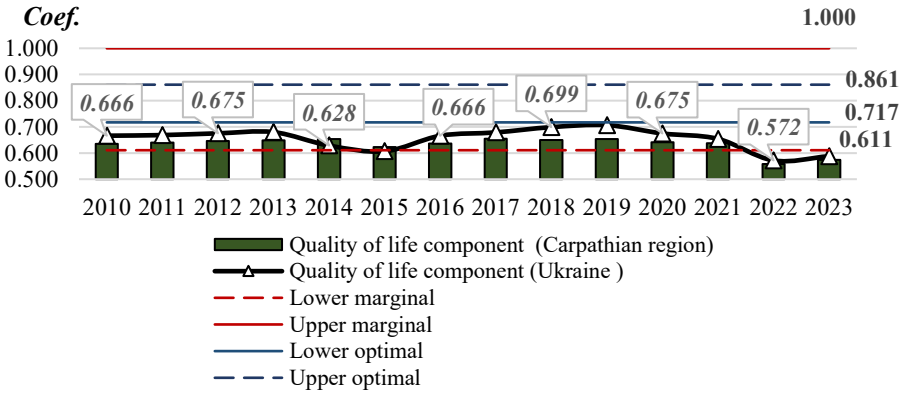

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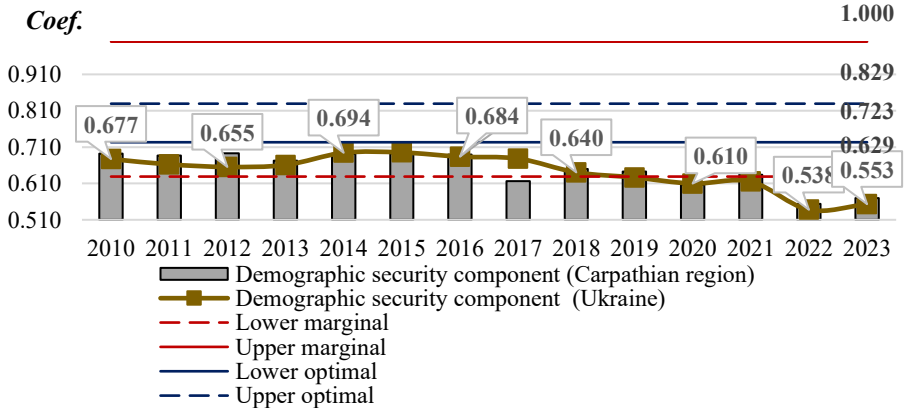

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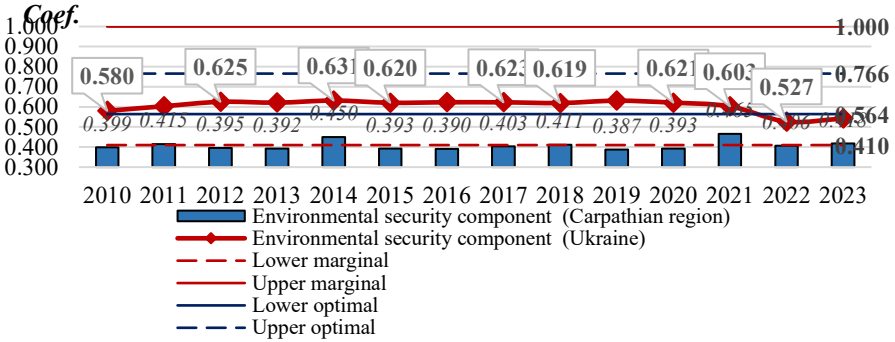

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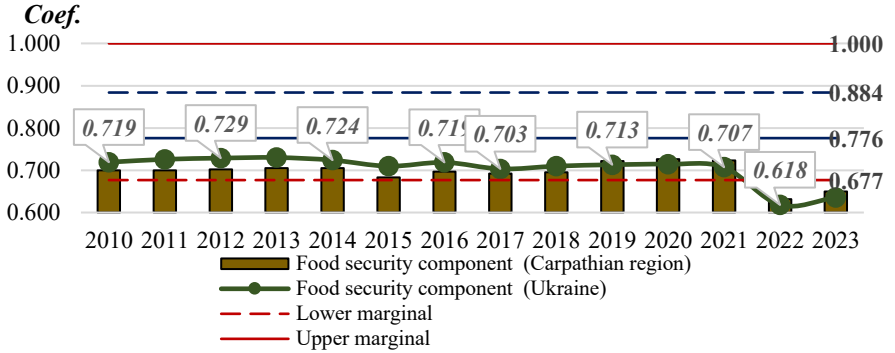

f) Food security component

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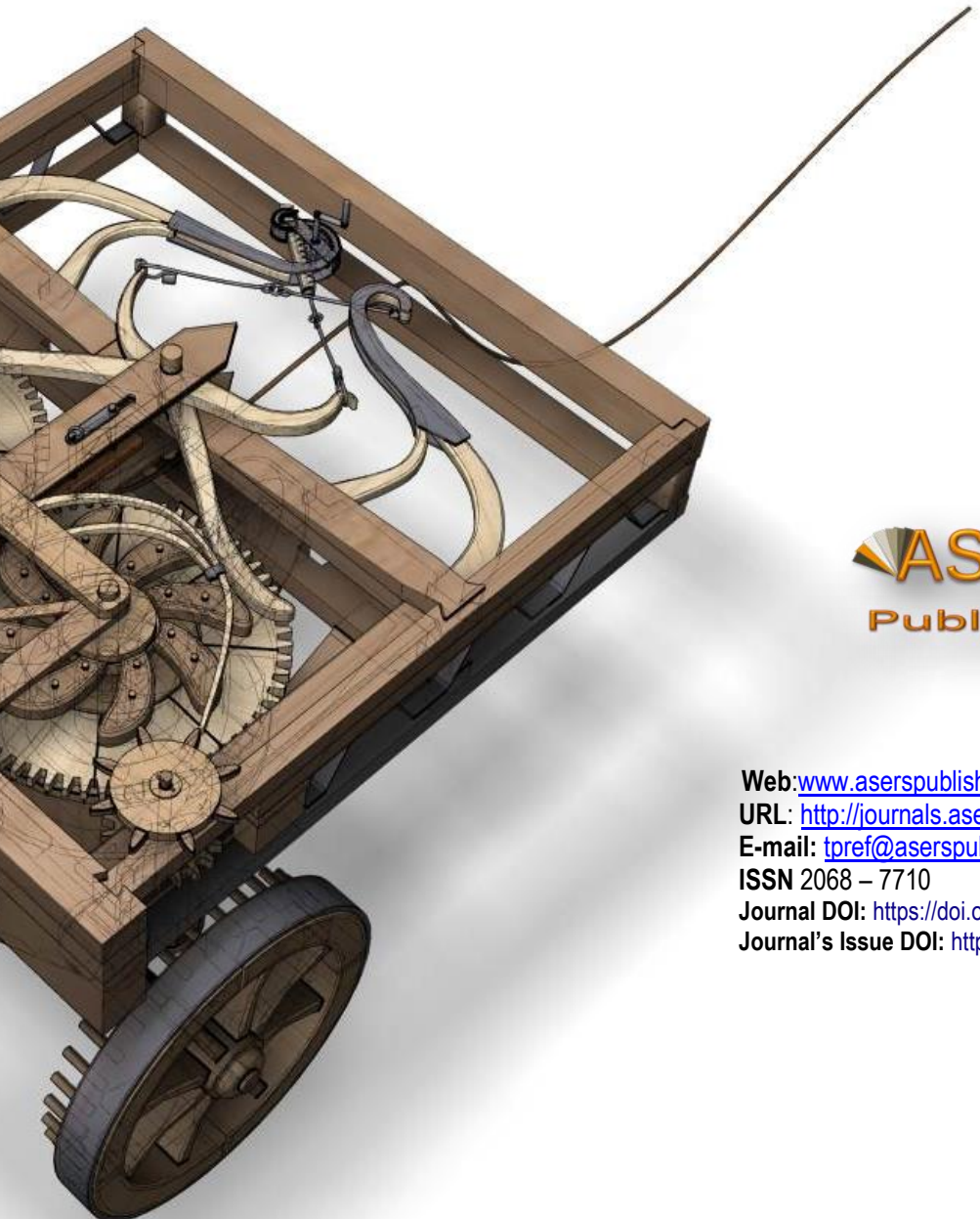

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