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EXTERNAL SHOCKS AND HUMAN SOCIAL SECURITY SYSTEM: EVIDENCE FROM UKRAINE

Olena Bazhenova

Taras Shevchenko National University of Kyiv
90a Vasylkivska Str., Kyiv, 03022, Ukraine
ORCID: 0000-0003-3197-8426, E-mail: olenabazhenova@knu.ua

Zakharii Varnalii

Taras Shevchenko National University of Kyiv
90a Vasylkivska Str., Kyiv, 03022, Ukraine
ORCID: 0000-0002-6479-6154, E-mail: vzs1955@gmail.com

Oksana Cheberyako

Taras Shevchenko National University of Kyiv
90a Vasylkivska Str., Kyiv, 03022, Ukraine
ORCID: 0000-0002-1563-9611, E-mail: cheberyako@knu.ua

Oksana Mykytiuk

Taras Shevchenko National University of Kyiv
90a Vasylkivska Str., Kyiv, 03022, Ukraine
ORCID: 0000-0002-8657-7278, E-mail: mykytiuk@knu.ua

The paper explores the impact of such an external factor as military aggression on the human social security system in Ukraine, since during a war this system mainly influenced by external factors than internal ones. To conduct the study, clustering was carried out using the Kohonen self-organizing maps on the dataset covering the period from 2010 to 2023 for 5 countries (Armenia, Azerbaijan, Georgia, Moldova and Ukraine) in order to identify common patterns, since all of them were subjected to military aggression. Results of the research showed that Ukraine during the full-scale war (since 2022) and for several years before it (given creeping aggression and Russia's occupation of Crimea in 2014) was located in the isolated cluster, the most striking features of which are internally displaced persons, armed forces personnel, and the proportion of people living below 50 percent of median income. In addition, clustering of countries worldwide in 2022 was carried out according to the same indicators. It was concluded that both full-scale hostilities and hybrid wars provoke

deteriorations in human social security. But, the degree of deceleration of the economic activity and, consequently, worsening of human social security varies depending on the character of the hostilities.

Keywords: *social security, threats, external shocks, war in Ukraine, clustering, Kohonen self-organizing map*

JEL Classification: C38, C45, H56, I32

1. Introduction

Altmeyer (1944), as a key figure in the design and implementation of the U.S. Social Security system, noted during World War II that problems of social security remain relevant not only during the war but also in the post-war period, and that is why we "must face them in the long-time development of social security". The behavior of the human social security system is stipulated by a number of internal and external factors. Thus, the stability of this system is considered as the ability to maintain its properties and characteristics unchanged due to internal and external disturbances. At the same time, internal factors should be decisive from the point of view of the stability of a human social security system. Nevertheless, the system of human social security during war is characterized by the predominance of external influences over internal ones (Bazhenova et al., 2024).

Moreover, during crisis and post-crisis periods, the social security system stimulates reducing the effects of external shocks and "can also translate into better crisis preparedness and better social policy in the future" (Prasad & Gerecke, 2010). Stiglitz (2009) also emphasizes the need of powerful social protection, as it can serve as an automatic stabilizer of the economy.

In addition, globalization significantly affects the level of social protection and income inequality (Tanzi, 2000). Firt of all, it concerns the effects of trade openness and increased mobility of production factors.

But in case of Ukraine, the dominant external influence is the military aggression, that's why it is nessecary to study the impact of this factor on human social security in Ukraine. This task objectifies

the need to determine empirically the influence of the military aggression on the indicators characterizing the level of social security. On this basis, a comprehensive and detailed picture of the impact of the war on the human social security system in Ukraine could be drawn with the aim of further developing effective economic and political solutions.

Thus, the study may include the empirical research of the effect of military aggression on the indicators of human social security. So, it is necessary to analize the effect of the military conflict on such indicators of social security as the number of recipients of social benefits, the share of the population covered by social security programs, etc. Finally, the study of the impact of the hostilities on the social and demographic sphere should consider such indicators as the number of internally displaced persons and refugees, since the increase in population displacement directly affects the demand for social security services (Bazhenova et al., 2023a). After identifying the indicators of social security (Bazhenova et al., 2024), we can begin to study the impact of war on the human social security system and determine its stability based on them.

So, the purpose of this paper is to shed light on the effect of military aggression on the human social security (on the example of Russia's invasion of Ukraine). The paper is organized in the following way. The Introduction presents the topicality of the study. In Chapter 2, we conduct overview of the literature on the topic of external factors of social security and the methods used to solve this problem. Chapter 3 describes the theoretical background of the study. Chapter 4 is devoted to data collection and the results of applying economic and mathematical methods. The final chapter gives some conclusions and possible directions for further research.

2. Literature overview

Publications on the studying the human social security comprise this problem at both the macro and micro levels. Besides it, modeling of human social security system and its subsystems covers a wide range of economic and mathematical methods.

Considering that the social sphere is a complex system with many qualitative features that describe and influence it, there is a temptation to use the tools of fuzzy set theory for its assessment and modeling, which effectively work with data of this nature. For example, in the article by Imanov and Akbarov (2012), fuzzy models for assessing the quality of a social system are constructed using the algorithm of fuzzy weighted rules. And in the paper by Imanov and Aliyev (2023), an interval-valued intuitionistic fuzzy pattern recognition model is proposed for assessing social cohesion, which, together with social security, are sub-indices that make up the social quality index.

However, such fuzzy approaches are appropriate for conducting quantitative evaluations taking into account expert assessments, but they do not cope with the tasks of identifying functional dependencies in historical data, which includes determining the influence of external shocks on social indicators. Thus, papers devoted to the study of the impact of external shocks on human social security, especially its specific issues concerning employment and labor market adjustments, contain mainly VAR framework, general equilibrium models, and cluster analysis (Bazhenova et al., 2023b; Kolot et al., 2022; Oliskevych & Lukianenko, 2020).

Numerous papers are devoted to the study of globalization effects on labor markets, since social protection mainly refers to poverty reducing measures and social insurance programmes or other labour market adjustments (Mitra & Ranjan, 2011). Among such papers we should highlight (Artuç et al., 2010), in which authors estimate workers' switching costs associated with moving between sectors as a result of trade shocks, given a rational expectations model of dynamic labor adjustment. These estimates imply large wage fluctuations due to trade shocks.

Cosar (2013) developed a two-sector model for a small open economy with overlapping generations (calibrated for Brasil) to study labor market behavior in response to trade liberalization. As results of the trade liberalization shock, high costs for displaced workers and a disproportionate adjustment burden for older workers may be observed. The model also allows to estimate the effects of alternative worker-assistance programs. Helpman and Itskhoki (2009) studied the

interaction of labor market rigidities and trade impediments in shaping welfare, trade flows, productivity, and unemployment by developing a two-country, two-sector model of international trade. They concluded that the openness of the trade leads to both rise and fall and of the unemployment rate, depending on the level of relative labor market frictions in the differentiated sector.

Davidson et al. (2006, 2007) measure economic losses as a percent of the net gains from trade, considering different labor market policies that may be used to compensate these losses. They concluded that the compensations for those moving and staying (wage and employment subsidies) would be low in case of a right labor policy. Dix-Carneiro (2010) studied the labor market response to trade liberalization based on a structural dynamic equilibrium model. As a result, he concluded the fact of rising costs due to worker mobility, mitigation of potential aggregate welfare gains, and the possibility of reducing losses by retraining workers initially employed in the adversely affected sector. In Dutt et al. (2009) the negative relationship between unemployment and trade openness for labor-abundant countries is justified. Nevertheless, for capital-abundant countries this relation is positive. At the same time, social protection and unemployment rate are positively related for all types of countries.

Lassila and Valkonen (2002) used a dynamic computable general equilibrium model with an overlapping generations structure to simulate the effects of external shocks in an open economy with different financing regimes, such as labour income and payroll taxes, value-added taxes, and capital income taxation. The external shocks are associated with a temporary rise in the international interest rate or a temporary reduction in export demand. As a result, both shocks correspond to the public sector deficits, while their effects are similar for different financing regimes. The results of the study show that the dynamics of social indicators are determined by both the public funding of social spending and the structure of the social protection system.

Matviychuk and Velykoivanenko (2014) proposed an approach to constructing mathematical models for assessing the fiscal, economic, and social effects as a result of external influences, in particular the

introduction of tax incentives, and determining the time lag when the effect of the incentives can be observed. It is shown that the social effect manifests itself faster than the others, when a noticeable increase in the number of full-time employees can be observed already a year after the positive impact.

In the paper by Gechert et al. (2021), the macroeconomic, fiscal and social impacts of legislative social security shocks are studied with the SVAR framework on the German data from 1970 to 2018. Authors concluded that the response of GDP, gross capital formation and employment is more persistent to shocks from social security benefits than from contributions. The response of consumption, by contrast, is much more pronounced for benefit shocks.

Finally, we would like to highlight the importance of using cluster analysis in social security research. In this context we should mention the paper by Chugunov and Nasibova (2021), in which authors use panel data regressions and cluster analysis to investigate the effect of public funding of social protection on social indicators for Eurozone countries.

In the article by Kolot et al. (2022), a clustering of the sectors of the Ukrainian economy is carried out based on indicators of economic development, number of employees, salary and structure of employees in order to identify patterns of their development in the context of digital transformation and subsequent forecasting of their macroeconomic dynamics depending on changes in the employment structure.

In (Bazhenova et al., 2023b), the authors apply such clustering methods as k-means and Kohonen self-organizing maps to divide countries into groups based on similar values of their social security features. A cluster analysis by method of k-means allowed to group 209 countries worldwide due to life expectancy at birth in 2021 and conclude that there exists a “trap of social insecurity” stipulating that a low level of income in the country leads to the degradation of human capital and fall in life expectancy at birth. Moreover, this mechanism substancially accelerated during military conflicts. Kohonen self-organizing maps are applied to cluster the conflict-affected countries such as Armenia, Azerbaijan, Georgia, Moldova

and Ukraine, based on the data for 10 explanatory variables related to human social security during the period of 2000-2020. The results of the cluster analysis demonstrated that life expectancy at birth is significantly influenced by economic development, especially GDP per capita. At the same time, the average life expectancy of the population is not affected by hybrid wars.

Thus, among the various methodological approaches explored in this literature review, clustering methods have proven to be particularly effective for studying the impact of military aggression on human social security, as military conflicts often generate complex, nonlinear, and multidimensional effects on social systems, which are difficult to model using parametric or assumption-driven approaches. Unlike traditional quantitative models, clustering techniques excel at uncovering hidden patterns, structural similarities, and group behaviors across diverse datasets.

For instance, clustering methods, such as Kohonen self-organizing maps, enable researchers to analyze a wide range of socio-economic and demographic indicators simultaneously, without the need to specify rigid functional relationships. Moreover, by capturing the heterogeneity of conflict impacts and revealing structural vulnerabilities across countries, clustering significantly enhances understanding of how armed aggression reshapes the landscape of human social security. Therefore, to study the impact of military aggression on key indicators of human social security, clustering using Kohonen maps will be applied.

3. Methodology

To conduct the cluster analysis, we are going to apply Kohonen self-organizing maps (Kohonen, 2001) that are an artificial neural network, which helps to group homogenous objects according to their similarities. It can help uncover patterns and structure in the analyzed input data that are not obvious in a multidimensional space, and can be useful for data analysis and data mining. In addition, these neural networks are robust to errors in the input data, which is not always typical of clustering algorithms.

Also, unlike other clustering approaches, the location of an object on the Kohonen map tells the analyst how developed the property being studied is compared to others, since the best and worst objects for the analyzed property are located at opposite corners of the self-organizing map (Lukianenko et al., 2023). This is an important property of this method when analyzing clustering results.

Thus, Kohonen algorithm is an approach to transforming a multidimensional space into a lower one. It results in vectors that are close in the initial space being in close proximity in the final map.

The Kohonen optimization algorithm includes such phases as initializing the weights for the neurons in the grid, loading data into the network, calculating the activation levels of neurons due to the input data, selecting the winner neuron (the neuron with the highest activation level, or in other words, the neuron in the map that best matches the input vector and determines which cluster the observation belongs to), revising the weights of the winner neuron and its neighbors using a learning rate (reduces the degree of adjustment of neuron parameters over time) and a neighborhood function (takes into account the distance to the winner neuron). All phases after loading the data are repeated for a given number of epochs, with the same set of observations being fed into the network multiple times to optimize its parameters.

4. Results

In order to identify the patterns in the human social security behavior in the context of the impact of external factors during war, we will focus on main internal features of this system that are under influence of military aggression. Among the internal factors of human social security, we will consider the most influential ones, identified in (Bazhenova et al., 2024):

– armed forces personnel in millions of people, consisting of "active duty military personnel, including paramilitary forces if the training, organization, equipment, and control suggest they may be used to support or replace regular military forces" (World Bank

Group, n.d.a). Moreover, this indicator characterizes the share of resources directed to the military sector and, accordingly, the burden on the economy. Considering the military expenditures as a means of defence a certain country against external aggression, they may provoke the economic development to slow down due to excessive burden on the economy and, as a result, affect the social sphere;

– domestic credit to private sector by banks in % of GDP covers "financial resources provided to the private sector by other depository corporations (deposit taking corporations except central banks), such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment" (World Bank Group, n.d.b). This indicator is considered crucial for poverty reduction, as private investments can significantly contribute to economic growth and development by providing jobs and generating incomes. Thus, private initiatives and investments could stimulate empowering of poor people by improving social security system;

– internally displaced persons, which are counted as the number of new displacements during the year of analysis related to conflict and violence, are described as "persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized state border" (OCHA, 2004);

– people using at least basic sanitation services as % of population, that is, "improved sanitation facilities that are not shared with other households. This indicator encompasses both people using basic sanitation services as well as those using safely managed sanitation services" (World Health Organization, 2017);

– proportion of people living below 50 percent of median income in %, which measures the level of inequality in the distribution of income within countries. Inequality undermines economic growth and development in the long run, limits the potential of growth to reduce poverty, and weakens social cohesion and trust (World Bank Group, n.d.c).

Modeling human social security in Ukraine during war to investigate the impact of external shocks is associated with a number of problems, primarily caused by the insufficient length of the data series, since the use of machine learning techniques requires data that cover observations over a long period of time. Hovewer, statistical data on human social security in Ukraine cover a set of annual observations that is too small to identify significant patterns, and given the heterogeneity of the processes under study, it leads to the impossibility of adequate modeling human social security in Ukraine using available statistical data.

Therefore, in order to study the impact of war as a main external shock on human social security in Ukraine, it is crucial to form a data set that will include information about other countries, the state and development of the social security system of which are similar to the Ukrainian one. In addition, the analysis of similarity of social protection systems should be carried out among countries that are victims of both hybrid wars and full-scale hostilities on the territory of the former USSR in order to increase the number of observations needed to model.

Therefore, in this paper we're going to cluster such countries as Armenia, Azerbaijan, Georgia, Moldova and Ukraine on the basis of mentioned indicators for a certain period. This will allow to group countries based on the characteristics of the human social security, taking into account the level of military conflicts in different years. Here we should note that hybrid wars in all these countries continued throughout the entire studied period.

For the selected countries, we extracted statistical data from the database World Development Indicators of the World Bank Group (2024) to form a dataset on human social security, consisting of the indicators mentioned above. So, the dataset covers 70 annual observations – 14 periods (from 2010 to 2023) for 5 countries (Armenia, Azerbaijan, Georgia, Moldova and Ukraine).

As the dataset contains gaps, we will use the average values of indicators for countries to fill them. This will not distort the clustering results because of the small percentage of gaps in the dataset and similarity of indicators across the selected countries. Then, to make

the data more comparable and thus eliminate the bias of the clustering results in favor of data with larger absolute values, we will normalize the data. For this purpose, we apply the min-max normalization to transform data so that all values are between 0 and 1, using the following formula:

$$x' = \frac{x - min(x)}{max(x) - min(x)}, \quad (1)$$

where x is the initial value of the indicator, x' – its normalized value, $\min(x)$ and $\max(x)$ are the minimum and maximum values of the indicator in the dataset, respectively.

The self-organizing map with a 12x9 hexagonal grid structure using a Gaussian as the neighborhood function was trained for 5000 epochs. The distribution of countries among five clusters is presented in Fig. 1.

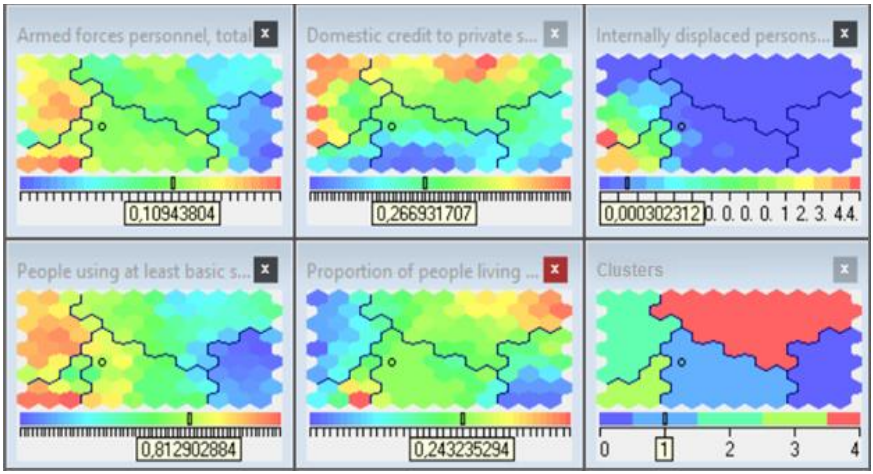

Fig. 1. Results of clustering five countries by characteristics of human social security in the period 2010-2023

According to the clustering results, observations for Ukraine from 2019 to 2023 fell into the third cluster, which is marked in light

green and isolated in the bottom left corner (Fig. 1). It stands out by high values of armed forces personnel, compared to other countries, which is due, among other things, to the acute phase of the conflict since 2022. This cluster is also characterized by a high percentage of people using at least basic sanitation services, living below 50 percent of median income and, at the same time, reduced domestic credit to private sector by banks since 2019, including the acute phase of the conflict. Overall, the most significant factors distinguishing this cluster (as can be seen in Fig. 2) are internally displaced persons (significance of 100%), armed forces personnel (99%), and proportion of people living below 50 percent of median income (significance of 75.5%).

Fig. 2. The significance of the characteristics of all clusters

Observations for Ukraine from 2010 to 2018 are in the second cluster in the upper left corner of the map in Fig. 1, together with the observations for Armenia during 2020-2022. This cluster is characterized by high values of armed forces personnel, internally displaced persons (in Armenia in 2020 and 2022), domestic credit to private sector, people using at least basic sanitation services, and low proportion of people living below 50 percent of median income. The last index indicates a sharp increase in the number of people with low incomes in Ukraine with the beginning of the active phase of the war.

The first cluster (in the lower central part of the map in Fig. 1) includes observations for Armenia during 2010-2012, Azerbaijan for the period 2014-2023, and Moldova for 2022 and 2023. The cluster stands out with low values for internally displaced persons and domestic credit to private sector, as well as average values of other factors. In turn, the zero cluster in the lower right corner of the map covers observations for Moldova during 2010-2021, which are characterized by low values of all indicators in comparison with other analyzed countries.

The remaining observations (for Armenia during 2013-2019 and 2023, Azerbaijan during 2010-2013, and observations for the entire period for Georgia) are in the fourth cluster (upper right corner of the map in Fig. 1). The significance of all indicators for this cluster is low (the highest is for the armed forces personnel indicator – 47.1%, and the rest are significantly lower), as is the case for the first cluster, which can be seen in Fig. 2.

This can be explained by the spread of indicator values within one cluster (which can be seen from the heatmaps in Fig. 1) and, accordingly, the ambiguity of the drawn boundaries. For this cluster, we should note relatively low values of people using at least basic sanitation services and the higher level of poverty due to high proportion of people living below 50 percent of median income compared to other observations. At the same time, this cluster is characterized by higher values of domestic credit to private sector by banks that signals about fueling the production, consumption and other economic processes, thus accelerating

economic growth. The numbers of internally displaced persons and armed forces personnel are low.

At the next stage of the study, in order to investigate the place of Ukraine in the world in terms of human social security, we will cluster the countries of the world using the same indicators as in the previous case, except for the proportion of people living below 50 percent of median income in % due to the lack of statistical data for most countries.

As a data source we also used the database World Development Indicators of the World Bank Group (2024). In this case, the data set covers observations for 151 countries in 2022. Thus, a number of countries were excluded from the sample due to the lack of data: American Samoa, Andorra, Argentina, Aruba, Bahamas, Bahrain, Bhutan, Bosnia and Herzegovina, British Virgin Islands, Cameroon, Cayman Islands, Channel Islands, Comoros, Cuba, Curacao, Democratic People's Republic of Korea, Dominica, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Faroe Islands, Federated States of Micronesia, French Polynesia, Gabon, Gibraltar, Greenland, Grenada, Guam, Iran, Isle of Man, Kiribati, Kosovo, Kuwait, Lao People's Democratic Republic, Lebanon, Liechtenstein, Macao Special Administrative Region, Maldives, Marshall Islands, Mauritania, Mauritius, Monaco, Nauru, New Caledonia, Northern Mariana Islands, Palau, Puerto Rico, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Seychelles, Sint Maarten (Dutch part), Solomon Islands, St. Kitts and Nevis, St. Lucia, St. Martin (French part), St. Vincent and the Grenadines, The Bermuda, Tonga, Tunisia, Turks and Caicos Islands, Tuvalu, Vanuatu, Virgin Islands (U.S.). They are mostly small economies, that's why this exclusion will not lead to distortions in the sample.

In addition, to fill the gaps in data we used the average values of indicators, and to align the data – the min-max normalization (1). The characteristics of the neural network are the same, except for the structure of the self-organizing map (hexagonal grid 16x12). As a result, we obtained the distribution of countries among six clusters, presented in Figs. 3 and 4.

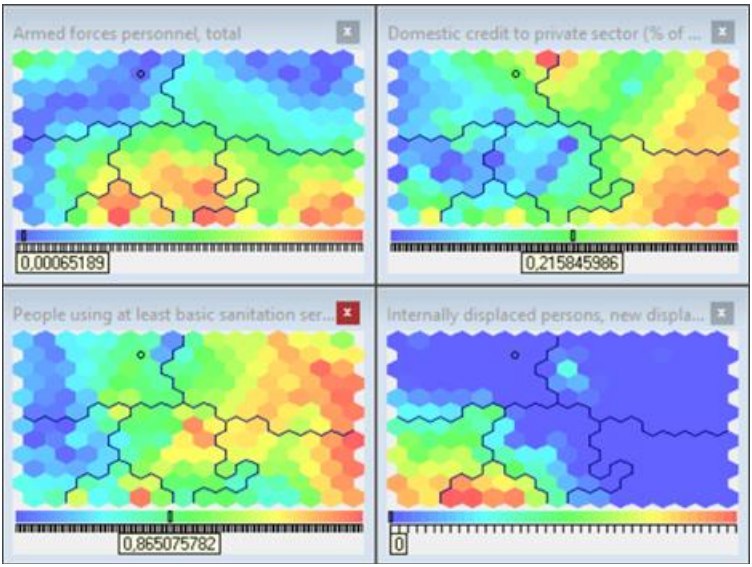

Fig. 3. Heatmaps for 4 characteristics of human social security when clustering 151 countries in 2022

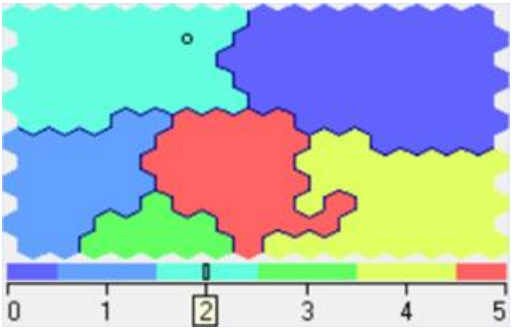

Fig. 4. Clustering of 151 countries by characteristics of human social security in 2022

The results of clustering show that Ukraine is located in cluster 3 (bottom of Kohonen map left of center, the number of which can be defined by the color in Fig. 4), which comprises eight countries,

including Bangladesh, Colombia, India, Israel, Kazakhstan, Myanmar, Pakistan. That is, countries exerted to internal conflicts and military aggressions and, as a consequence, to a surge of internally displaced persons.

For example, in early 2022, Kazakhstan faced large-scale demonstrations, triggered by a significant surge in the price of liquefied petroleum gas, which soon evolved into a broader political movement. The unrest eventually led to violent clashes between demonstrators and state security forces. In Colombia, during 2022, there were intensifications of internal armed violence, involving confrontations between government forces and various non-state armed factions that contributed to ongoing instability and displacement in affected regions. Since the military coup of 2021, Myanmar has remained embroiled in widespread armed conflict, often described as a civil war. The continued violence throughout 2022 led to a growing number of internally displaced individuals, exacerbating the humanitarian crisis in the country.

During 2022, India and Pakistan continued to experience strained relations with isolated military incidents, including skirmishes that occurred along contested borders, mainly in Kashmir. Moreover, India faced ongoing religious and ethnic tensions, which occasionally escalated into outbreaks of violence that underscored the country's deep-rooted societal divisions. Finally, in 2022, Bangladesh faced both political unrest and severe flooding. Political demonstrations during this period added further strain to an already vulnerable national context, causing an increase in the number of internally displaced persons. Also, the environmental disaster led to widespread destruction and heightened humanitarian needs.

Thus, as can be concluded from the heatmaps in Fig. 3, cluster 3 is characterized by the largest armed forces personnel, and the percentage of people using at least basic sanitation services is above average compared to countries around the world. Domestic credit to the private sector for countries in this sector is at medium level.

In the context of the analysis of Kohonen maps, the corner clusters are of greatest interest, since, as already mentioned, they can be used to determine the most and least developed countries according to the

studied characteristic. The level of development of countries in the remaining clusters is determined by their proximity to these two extreme clusters. We are primarily interested in the corner cluster closest to Ukraine, located in the lower left corner of Fig. 4 (cluster 1). As can be seen from the heatmaps in Fig. 3, the countries of this cluster are characterized by a low level of domestic credit to the private sector and the percentage of people using at least basic sanitation services, as well as armed forces personnel.

The second cluster, located in the upper left corner, is also characterized by the same low levels of these indicators. But, given that the second cluster has a low level of internally displaced persons, which indicates the absence of military conflicts there, unlike the countries of the first cluster, where the value of this indicator is high, then it is the first cluster, neighboring Ukraine, will be considered the least socially protected. And the presence of Ukraine next to it in 2022 (the first year of full-scale aggression from Russia) points to low human social security.

This first cluster includes some countries in Sub-Saharan Africa, Latin America and the Caribbean, where there are ongoing military conflicts (totally 19 countries, including Central African Republic, Chad, Congo, Mali, Niger, Somalia, South Sudan). The already mentioned cluster 2 includes 38 countries, mainly in Sub-Saharan Africa (Angola, Botswana, Cabo Verde, Cote d'Ivoire, Ghana, Lesotho, etc.).

Countries characterized by small armed forces personnel, the absence of internally displaced persons, but high values of domestic credit to private sector by banks and the percentage of people using at least basic sanitation services are located in cluster 0 (a total of 40 countries). These are mainly emerging and developing economies in Asia and some countries of the European Union. Similar characteristics, but with a sufficiently large number of armed forces personnel, describe cluster 4 in the lower right corner of the Kohonen map in Fig. 4. It includes countries such as China, Germany, France, Great Britain, The USA, etc. (28 countries in total).

Cluster 5 in the center of the map in Fig. 4 covers 16 countries that are characterized by low values of domestic credit to private sector,

but high values of people using at least basic sanitation services and armed forces personnel, as well as the absence of internally displaced persons. For instance, here we have such countries as Algeria, Egypt, Indonesia, Mexico, Peru, Philippines, Turkmenistan, Uzbekistan, etc.

Conclusions

The war has a devastating impact on the country's economy, which in turn lowers the standard of living of citizens. The destruction of enterprises, infrastructure, the outflow of capital and labor, inflation and unemployment – all this threatens the economic stability and human social security. People face a crisis in access to basic needs such as food, health care, housing.

Therefore, in this study we attempted to determine the degree of impact of such external factors as hybrid and full-scale wars on the social security of countries. To do this, we conducted clustering using the Kohonen self-organizing maps. In order to increase the sample to search for meaningful patterns, in addition to Ukraine we also included information about other countries that have been victims of both hybrid wars and full-scale hostilities – Armenia, Azerbaijan, Georgia and Moldova.

It was decided to assess the impact of armed conflict using the following internal indicators: armed forces personnel in millions of people; domestic credit to private sector by banks in % of GDP; internally displaced persons as the number of new displacements associated with conflict and violence; people using at least basic sanitation services as % of population; the proportion of people living below 50 percent of median income in %. This allowed to classify countries by the level of conflict based on indicators of human social security.

Results of clustering demonstrated that observations for Ukraine during the acute phase of the war and three years before it fell into a separate cluster, associated mainly with highest values of the indicators of internally displaced persons, armed forces personnel, and proportion of people living below 50 percent of median income compared to other countries.

The Karabakh conflict between Armenia and Azerbaijan in 2020, 2022 and 2023 did not have such consequences for human social

security that these observations were allocated either to a separate cluster or to a cluster with observations on Ukraine during the war. Although internally displaced persons were also present during this period, there were no significant changes in other indicators.

In addition, the clustering of countries of the world in 2022 showed a precise correlation between the level of human social security and presence of military conflicts. Thus, we should conclude that full-scale war causes a significant deterioration in human social security, but the presence of hybrid wars does not lead to such worsening. We may conclude that countries during periods of hybrid wars suffer from deceleration of the economic activity and, consequently, some deterioration in social security. Altough, such a deterioration is much less devastating than during the full-scale war.

Concluding, we should note that war seriously threatens human social security. It is not only a physical threat, but also economic, psychological and social problems that arise as a result of hybrid and full-scale conflicts. Therefore, to maintain stability in society, it is necessary to implement a comprehensive approach to solving these problems, ensure human rights and create conditions for recovery after the conflict. In this context, restoring infrastructure, providing social services, assisting victims, and rehabilitating people are essential for the stability of the country in the post-conflict period. Moreover, it is crucial to ensure access to education, health services, as well as social integration of those who survived the war, in order to restore the social capital of the country.

In the context of identifying the possible directions for further research, we may highlight the necessity to explore the effect of other external shocks to which human social security in Ukraine is exerted, as well as to predict the consequences of all these shocks.

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