ECONOMY AND MANAGEMENT

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FINANCIAL SECURITY OF MACRO REGIONS IN THE PERIOD OF MILITARY AGGRESSION

Purpose. Formulation of the main factors affecting the internal migration of the population during the period of military aggression, creation of an economic-mathematical model that will reproduce the number of internally displaced persons (IDPs) for forecasting the financial support of macro-regions.

Methodology. The research used general scientific and special research methods: the method of critical analysis, scientific abstraction and generalization of scientific experience of modern theoretical studies, methods of statistical analysis, expert evaluations, system-complex approach.

Findings. The main differences in the reasons for the country citizens' migration are identified in peacetime and in wartime. The factors that increase the behavioral uncertainty of displaced persons are outlined. It is proposed to create economic and mathematical models that will reproduce the dynamics of the number of displaced persons people to forecast the financial provision of macro-regions using the method of correlation-regression analysis. Invariable indicators that have the greatest impact on the number are determined for new arrivals in the specified territories.

Originality. The economic and mathematical models presented in the article reproduce the dynamics of the number of internally displaced persons based on statistical data of a representative survey. Unlike the existing ones, they take into account the main factors that affect the internal migration of the population during the period of military aggression.

Practical value. The economic-mathematical models presented in the article can be applied in practice in the methods for calculating the financial needs of regions, individual regions and settlements to forecast the number of forced migrants. The method proposed in the article for calculating the forecast quantity of internal migrants allows timely adjustment of the components of economic and mathematical models, which contributes to increasing their reliability.

Keywords: *financial support, migration, displaced persons, macro-region, armed aggression, financial needs*

Introduction. The process of planning and formation of state and local finances in peacetime took into account the change in the population of macro-regions caused by the globalization of the world economy, the consolidation of cultures and religions, demographic crises in some developed countries, etc. The study on migration processes was conducted mainly from the point of view of analysis, evaluation and provision of conditions for labor migration and tourism. Armed aggression and occupation of certain territories of Ukraine caused mass displacement of the civilian population both within the country and abroad. This movement highlighted the problems, which have not yet been resolved either by state bodies or volunteer organizations: material and food support large flows of people, their psychological rehabilitation, low capacity of transport routes, lack of funds in local budgets for the needs of evacuation or accommodation of refugees, etc.

Literature review. The experience of local military conflicts, which cause mass external and internal migration of the indigenous population, is always carefully studied by interna-

tional organizations, scientists and specialists. This is caused by the need for accommodation, food and material support and rehabilitation of refugees. The analysis of foreign scientific sources allows us to draw conclusions about the predominantly humanitarian and social orientation of these studies. Thus, I. Khokar and C. K. Hassan in [1] conduct empirical studies that establish correlations between war trauma, torture and post-traumatic stress disorder; Noor Abdo, F. Sweidan and A. Batieha in [2] examine the quality of life of Syrian refugees living in Jordan, compared to Jordanians and other countries. Quality of life of Syrian refugees, who live in camps in Kurdistan in Iraq are studied by I. A. Aziz, K. W. Hutchinson, and D. Maltby [3]; C. F. Burr, R. Amos, S. Nevitt, K. Dauric, and R. G. White conduct a systematic review of factors associated with the quality of life of asylum seekers and refugees in high-income countries[4]. A cross-sectional pilot study [5] by F. A. Masri, M. Muller, J. Nebl, T. Greupner on the quality of life of Syrian refugees in Germany is of scientific interest.

Until now, Ukraine has not had modern practical experience movement of large masses of the population as a result of hostilities on their territory. However, theoretical studies on certain aspects of evacuation management were conducted both

during the times of the USSR and after gaining the independence. The theoretical issues of managing the movement of the population in emergency situations are covered both in educational and scientific and methodical sources on civil protection of citizens: tasks are defined of transport support for evacuation transports, as well as functions and tasks of evacuation authorities, procedure for planning evacuation measures, action algorithms, options for decisions and orders from transportation are proposed. On their basis, authorities and local self-government bodies [6, 7] have developed practical instructions for the organization, planning, and conduct of evacuation, where the sources of its financing are determined. Ukrainian scientists conduct research on financial aspects related to the external and internal movement of Ukrainians: A. O. Zadoya in [8], O. P. Podra, N. Ya. Petryshyn in [9] investigate the scope, causes, and consequences of migration processes in Ukraine; V. G. Margasova in [10, 11] examines the financial instruments of the state policy of economic development in Ukraine and defines risk management instruments for emergency situations. Yu. I. Pylypenko in [12] investigates civic coordination as a factor in the effectiveness of providing local public goods, and I. P. Otenko in [13] solves the issue of export-import development of regions.

Unsolved aspects of the problem. Fluidity of large masses of peaceful people in wartime highlighted complex and still unresolved in practice problems of a financial, logistical, and humanitarian nature. The outflow of a large number of labor resources, disruptions in logistics, the impossibility of doing business in the occupied areas caused a significant decrease in revenues to the state and local budgets. The lack of funds is most acutely felt in the regions that received a large number of forced migrants. There is an urgent need for a detailed study on financial needs and justification of the need for reinforcing state support of individual regions of Ukraine during the period Russian armed attack.

Purpose. The purpose of the article is to formulate the main factors affecting the internal migration of the population during the period of military aggression, to create an economic-mathematical model that will reproduce the number internally displaced persons (IDPs) for the forecast of financial provision of macro-regions.

Methods. The research used general scientific and special research methods: the method of critical analysis, scientific abstraction and generalization of scientific experience of modern theoretical studies, methods of statistical analysis, expert evaluations, system-complex approach.

Results. Mass movement of a significant number of citizens last occurred in Ukraine during its evacuation from the Chernobyl disaster zone. But even then it was not on such a scale as it is now — during the armed aggression of the neighboring state. Population migration during war is fundamentally different from peacetime:

- change of residence in peacetime is carried out in most cases by healthy people of working age, accommodation and housing are paid for by migrants themselves or at the expense of the host party;

- part of the persons displaced through the war may be ill or have a disability, and, therefore, will require special conditions of maintenance;

- all displaced persons have suffered from violence to a greater or lesser extent, are in a state of stress and in most cases need long-term rehabilitation;

- women constitute most of the forced refugees;

- the population in peacetime creates savings, in wartime — uses them;

- in peacetime, most savings are spent by citizens on the purchase of real estate and durable goods, in wartime — on basic necessities, movement, accommodation and food;

- during the period of military confrontation large stocks of long-term storage products, hygiene products are created by ordinary people and things are purchased that they never used or used very rarely (lamps, gas burners, candles, energy accumulators, warm clothes, heaters, etc.)

- in a peaceful country of salvation of victims takes place in regions that are not under the influence of an emergency situation, in a state attacked by the enemy — as far as possible from the territory of hostilities.

Difficulty in managing movement of refugees in the conditions of an armed invasion is increased by their significant behavioral uncertainty in occupied, unoccupied and liberated territories: according to the results of research [14, 15], not all the people from territories under threat of occupation, undergo registration at a new place of temporary stop or residence. As a rule, they are registered only to receive humanitarian aid or assistance in finding housing. According to estimates [15], about half of the migrants changed their place of residence at the beginning of the invasion, others — when their territorial communities were under a real threat of occupation, and 5 % of victims of armed aggression left their homes only when they found themselves in the line of direct fire contact with the enemy.

It can be argued that now change of residence is performed by all household members, except for those who are mobilized and men under 60 years of age. Migration of civilians during the period of military aggression is determined by non-deterministic stochastic processes, which are accompanied by:

- purposeful actions by the aggressor country to destabilize the moral and economic state of attacked people, which are difficult to research and analyze due to limited available information;

- the lack of a theoretical and methodological basis for protection and provision of citizens of Ukraine in the period of an armed invasion due to a general previous mistake about the improbability of an attack;

- a vague idea of the real goal and directions of providing protection and provision for people and property in wartime, which leads to uncoordinated and ineffective actions by stakeholders.

— significant disruptions in logistics and critical disruptions in the operation of the transport infrastructure;

- absence of savings among the majority residents of Ukraine sufficient for internal or external displacement in the event of the threat of occupation of the territories (Table 1).

Table 1

The possibility of accumulating savings of Ukrainian households [14] in 2014−2021

	2014	2015	2016	2017	2018	2019	2020	2021
Total resources on average per month per household, hryvnias	4343.9	5064.9	6056.2	8081.8	9610.8	12,405.9	13,030.9	15,783.0
Cumulative expenses on average per month per household, hryvnias	4048.9	4952.0	5720.4	7139.41	8308.6	9670.2	9523.6	11,243.4
Maximum possible savings per month, hryvnias	295	112.9	335.8	942.39	1302.2	2735.7	3507.3	4539.6
Maximum possible savings per year, hryvnias	3540	1354.8	4029.6	11,304	11,308.68	32,828.4	42,087.6	54,475.2
Maximum possible savings per year, USD at the year-end exchange rate	224.47	56.45	148.20	402.85	411.89	1409.5	1489.3	2002.1

Composition of macro-regions of Ukraine [17]

Macroregion (the number of inhabitants at the beginning of the armed aggression, population)	Areas that are part of the macro-region (the number of inhabitants at the beginning of the armed aggression, population)
Kyiv (2952301)	Kyiv
Center (5119565)	Poltava (1413829), Cherkasy (1220363), Kirovohrad (956250), Vinnytsia (1529123)
West (10594419)	Rivne (1160647), Volyn (1038457), Lviv (2529608), Ternopil (1052312), Khmelnytskyi (1274409), Zakarpattia (1254327), Ivano-Frankivsk (1377496), Chernivtsi (907163)
East (7593826)*	Kharkiv (2694007), Dnipro (3176648), Zaporizhzhia (1723171), Luhansk (2167802), Donetsk (4200461)
South (4493086)	Kherson (1000370), Mykolaiv (1141324), Odesa (2351392)
North (5099885)	Sumy (1094284), Kyiv (1754284), Zhytomyr (1231239), Chernihiv (1020078)

* without taking into account the quantity of residents from Luhansk and Donetsk regions;

** quantity data residents of this area were not used in further calculations

To conduct the research, the authors chose, as a basis, the data from the reports of the UN International Organization for Migration [15], as well as other international [14] and domestic [16, 17] information agencies.

The UN International Organization for Migration conducts a representative express assessment of presence of forced migrants who have changed their location on the territory of the country. Table 2 shows the composition of macro-regions according to the grouping of administrative-territorial units used in [17].

A negative factor is a noticeable increase in external and internal migration, which leads to economic congestion in certain regions (Table 3).

Despite the rather significant fluctuations of the mathematical expectation and standard deviation of the number of forced refugees in Ukraine, who suffered from the military aggression during the first three rounds of representative evaluation, the coefficient of variation remains unchanged at 52 %, and during the next five − it is within the range of 39−50 % (Table 4). This indicates minor changes in the number of IDP flows. The relative dispersion of data on the number of IDPs by macro-regions also has slight differences (11−14 %), with the exception of the southern region (59 %) and the city of Kyiv (108 %).

The need for financial support of the macro-region during the period of military aggression is described by the formula

$$FZ = FZ_B + FZ_B \cdot K_{VPO} \cdot KP_{VPO},$$

where FZ_B is the financial support of the macro-region before its adoption of internally displaced persons; K_{VPO} is the ratio of

Changes in estimates of the presence of internally displaced persons at the macro-regional level [15]

A round of representative express evaluation	The number of forced migrants within the country, persons						
	Kyiv	East	South	West	North	Center	Average for Ukraine
16.03−21.03	183,000	1,123,000	418,000	2,566,000	1,045,000	1,123,000	1,076,333
24.03−1.04	357,000	857,000	357,000	2,927,000	1,285,000	1,356,000	1,189,833
Abs. deviations by macro-region	174,000	−266,000	−61,000	361,000	240,000	233,000	113,500
Relative deviation by macro-region, %	95.08	−23.69	−14.59	14.07	22.97	20.75	10.55
11.04−17.04	114,000	1,459,000	228,000	2,850,000	1,254,000	1,802,000	1,284,500
Abs. deviations by macro-region	−243,000	602,000	−129,000	−77,000	131,000	446,000	94,667
Relative deviation by macro-region, %	−68.07	70.25	−36.13	−2.63	−2.41	32.89	7.96
29.04−3.05	238,000	1,472,000	519,000	2,900,000	1,234,000	1,666,000	1,338,167
Abs. deviations by macro-region	124,000	13,000	291,000	50,000	−20,000	−136,000	53,667
Relative deviation by macro-region, %	108.77	0.89	127.63	1.75	−1.59	−7.55	4.18
1.06−11.06	194,000	1,794,000	562,000	1,838,000	1,319,000	1,427,000	1,189,000
Abs. deviations by macro-region	−44,000	322,000	43,000	−1,062,000	85,000	−239,000	−149,167
Relative deviation by macro-region, %	−18.49	21.88	8.29	−36.62	6.89	−14.35	−11.15
15.06−28.06	431,000	1,855,000	324,000	1,574,000	668,000	1,423,000	1,045,833
Abs. deviations by macro-region	237,000	61,000	−238,000	−264,000	−651,000	−4000	−143,167
Relative deviation by macro-region, %	122.16	3.40	−42.35	−14.36	−49.36	−0.28	−12.04
17.07−23.07	473,000	1,936,000	667,000	1,333,000	1,118,000	1,118,000	1,107,500
Abs. deviations by macro-region	42,000	81,000	343,000	−241,000	450,000	−305,000	61,667
Relative deviation by macro-region, %	9.74	4.37	105.86	−15.31	67.37	−21.43	5.90
12.07−24.07	410,000	1,943,000	669,000	1,728,000	1,188,000	1,037,000	1,162,500
Abs. deviations by macro-region	−63000	7000	2000	395,000	70,000	−81,000	55,000
Relative deviation by macro-region, %	−13.32	0.36	0.30	29.63	6.26	−7.25	4.97
The population of the macro-region in peacetime	2,952,301	7,593,826	4,493,086	10,594,419	5,099,885	5,119,565	5,975,514

The main probabilistic characteristics of the internal migration of citizens caused by the armed invasion

A round of representative express evaluation	Probability of internal movement of citizens to the region, %						Mathematical expectation of the number of IDPs in Ukraine	Standard deviation	Coefficient of variation
	Kyiv	East	South	West	North	Center			
16.04−21.04	2.83	17.39	6.47	39.73	16.18	17.39	1,611,466.7	831,371.32	0.52
24.03−1.04	5.00	12.00	5.00	41.00	18.00	18.99	1,827,516	954,192.53	0.52
11.04−17.04	1.48	18.93	2.96	36.98	16,27	23,38	1,963,913.5	1,023,351.31	0.52
29.04−3.05	2.96	18.33	6.46	36,12	15.37	20.75	1,893,274.5	944,135.67	0.50
1.06−11.06	2.72	25.15	7.88	25.76	18.49	20.00	1,503,539.4	669,914.02	0.45
15.06−28.06	6.87	29.56	5.16	25.08	10.65	22.68	1,383,329.2	650,812.85	0.47
17.07−23.07	7,12	29,13	10.04	20.06	16.82	16.82	1,308,269.5	516,548.84	0.39
12.07−24.07	5.88	27.86	9.59	24.77	17.03	14.87	1,414,137.2	592,481.13	0.42
Mathematical expectation of the number of IDPs in the macro-region	124,427	2,949,044	277,321	5,884,864	1,499,511	2,170,280	–	–	–
Standard deviation	134,059.69	402,271.92	162,391.06	662,322.32	210,266.79	271,474.2	–	–	–
Coefficient of variation	1.08	0.14	0.59	0.11	0.14	0.13	–	–	–

numbers of refugees from territories under threat of occupation to the population of the macro-region at the end of 2021; KP_{VPO} is the coefficient that takes into account the difference in financial needs of internal migrants from needs of indigenous inhabitants of the macro-region (additional funds for housing rent, purchase of basic necessities, etc.).

It is proposed to create an economic-mathematical model that will reproduce the dynamics of quantity of internally displaced persons to forecast the financial support of macro-regions using the method of correlation-regression analysis

$$K_{VPO} = \sum_{i=1}^{n} a_i X_i,$$

where K_{VPO} is a dependent variable; a_i is regression model coefficients; X_i are model factors, $I = 1, ..., n$.

To bring the output data of the calculation of the regression model to the single dimension, K_{VPO} is taken as a ratio of numbers of internally displaced persons to the quantity of residents of a macro-region in peacetime.

The variable indicators that have the greatest influence on the value of K_{VPO} were determined by the method of expert evaluations:

$X1$ is the coefficient that takes into account the ratio of the number of households that arrived in the macro-region in their own transport to the total number of internally displaced households in the macro-region;

$X2$ is the ratio that takes into account the ratio of the number of displaced households with minor children or disabled members to the total number of internally displaced households in the studied area;

$X3$ is the coefficient that takes into account the ratio of the number of employed people immigrants to the total amount of internally displaced persons in the macro-region;

$X4$ is the coefficient that takes into account the ratio of the quantity of refugee citizens with intentions of further movement to the total number of such persons in the macro-region;

$X5$ is the coefficient that takes into account the number of women among internally displaced persons in the macro-region;

$X6$ is the coefficient that takes into account the quantity ratio people who were forced to leave their homes because of the war and applied for public assistance or have social benefits

to the total number of internally displaced citizens in the studied area.

Initial data for obtaining the calculation model of internally displaced persons in Kyiv are presented in Table 5.

An economic-mathematical model that reproduces the dynamics of the quantity of Ukrainians refugees for the forecast of financial support of the city of Kyiv, created using the correlation-regression analysis method, looks like this

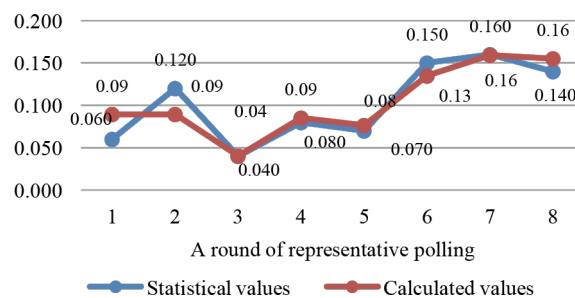$$K_{VPO} = 0.9 - 0.34X1 - 0.39X2 - 0.69X3 - 0.57X4 + 0.66X5 - 1.84X6.$$

Fig. Graphic representation of statistical and calculation models

Primary data for the calculation model for the city of Kyiv [15, 17]

K_{VPO}	$X1$	$X2$	$X3$	$X4$	$X5$	$X6$
0.06	0.41	0.86	0.1	0.9	0.53	0.05
0.12	0.42	0.85	0.14	0.81	0.55	0.08
0.04	0.35	0.89	0.19	0.76	0.57	0.11
0.08	0.33	0.66	0.25	0.65	0.62	0.13
0.07	0.27	0.64	0.34	0.63	0.61	0.12
0.15	0.31	0.71	0.44	0.58	0.65	0.12
0.16	0.34	0.72	0.45	0.45	0.65	0.15
0.14	0.26	0.78	0.46	0.42	0.68	0.17

Graphic representation of statistical and calculation models that reflect the quantity dynamics of internally displaced persons for forecasting financial support of the researched macro-region of Kyiv are shown in Figure.

The accuracy of the economic-mathematical model, which shows quantity dynamics of internally displaced persons for forecasting the financial support of the city of Kyiv, the average relative error of approximation is calculated according to the formula

$$\bar{\varepsilon} = \frac{1}{n}\sum_{i=1}^{n}\left|\frac{Y_i - Yprogn_i}{Y_i}\right| \cdot 100;$$

$$\bar{\varepsilon} = 14.02 < 15\ \%.$$

This testifies to the sufficient accuracy of the obtained calculation model.

Mathematical formulas are obtained in a similar way which describe the economic processes of the dependence of the financial support of other studied territories on the change in the number of refugees arriving in them from occupied areas or from those threatened with occupation. The initial data for calculations are given in Tables 6–10.

Thus, the effective mathematical formula that describes economic processes and is used to forecast financial provision, determining changes in the number of arrivals to the central macro-region of persons who suffered from armed aggression looks like

Center: $K_{VPO} = -3.42 + 1.27X1 + 0.49X2 + 1.08X3 + 1.79X4 +$

$+ 1.37X5 + 5.08X6.$

The economic-mathematical model that describes the dynamics of the number of internal migrants and serves to forecast needs for funds of the large region, which includes Khmel-

Table 6

Elementary data for creating the mathematical formula for calculation of the quantity of internally displaced persons in the macro-region "Central" (Poltava, Cherkasy, Kirovohrad and Vinnytsia regions) [15, 17]

K_{VPO}	X1	X2	X3	X4	X5	X6
0.22	0.43	0.89	0.09	0.81	0.54	0.03
0.26	0.37	0.86	0.15	0.84	0.52	0.05
0.35	0.33	0.88	0.21	0.76	0.53	0.08
0.33	0.27	0.65	0.39	0.64	0.61	0.1
0.28	0.28	0.67	0.42	0.61	0.59	0.11
0.28	0.32	0.75	0.35	0.58	0.63	0.13
0.22	0.37	0.71	0.34	0.43	0.63	0.17
0.20	0.25	0.79	0.36	0.41	0.66	0.15

Table 7

Information to obtain the calculation model of the number of forced internally displaced persons in the macro-region "West" [15, 17]

K_{VPO}	X1	X2	X3	X4	X5	X6
0.24	0.39	0.86	0.09	0.88	0.58	0.06
0.28	0.39	0.88	0.12	0.82	0.59	0.08
0.27	0.44	0.83	0.15	0.76	0.61	0.12
0.27	0.45	0.83	0.26	0.65	0.66	0.14
0.17	0.33	0.78	0.35	0.62	0.71	0.25
0.15	0.35	0.76	0.42	0.55	0.74	0.31
0.13	0.45	0.75	0.34	0.42	0.75	0.33
0.16	0.42	0.73	0.38	0.41	0.75	0.24

Table 8

Output data for obtaining a correlation-regression model describing the stochastic movement of persons affected by Russian aggression in the studied region "East" [15, 17]

K_{VPO}	X1	X2	X3	X4	X5	X6
0.15	0.65	0.41	0.07	0.62	0.74	0.08
0.11	0.69	0.39	0.08	0.71	0.75	0.12
0.19	0.63	0.39	0.10	0.73	0.71	0.15
0.19	0.65	0.36	0.25	0.71	0.69	0.25
0.24	0.63	0.35	0.24	0.61	0.68	0.26
0.24	0.58	0.34	0.26	0.59	0.66	0.27
0.25	0.41	0.36	0.21	0.45	0.70	0.22
0.26	0.32	0.41	0.28	0.41	0.71	0.28

Table 9

Data for building the calculation model of the number of internally displaced persons in the southern macro-region [15, 17]

K_{VPO}	X1	X2	X3	X4	X5	X6
0.09	0.65	0.81	0.11	0.75	0.77	0.04
0.08	0.69	0.78	0.09	0.69	0.79	0.08
0.05	0.63	0.75	0.15	0.62	0.81	0.09
0.12	0.65	0.65	0.18	0.64	0.72	0.12
0.13	0.63	0.62	0.22	0.65	0.69	0.15
0.07	0.58	0.71	0.25	0.68	0.65	0.22
0.15	0.41	0.71	0.32	0.55	0.65	0.25
0.15	0.32	0.69	0.34	0.56	0.55	0.27

Table 10

Initial data for obtaining the population calculation model for internally displaced persons in the northern macro-region [15, 17]

K_{VPO}	X1	X2	X3	X4	X5	X6
0.20	0.87	0.71	0.09	0.77	0.76	0.05
0.25	0.86	0.75	0.08	0.68	0.78	0.08
0.25	0.89	0.69	0.10	0.62	0.83	0.11
0.24	0.65	0.62	0.35	0.64	0.85	0.13
0.26	0.74	0.65	0.29	0.62	0.82	0.14
0.13	0.74	0.74	0.27	0.59	0.79	0.15
0.22	0.75	0.76	0.34	0.42	0.78	0.21
0.23	0.79	0.74	0.36	0.33	0.74	0.27

nytskyi, Zakarpattia, Ivano-Frankivsk, Chernivtsi, Rivne, Volyn, Lviv, and Ternopil regions, looks as follows

West: $K_{VPO} = 0.04 - 0.6X1 - 0.7X2 - 0.99X3 - 0.85X4 +$

$+ 0.52X5 - 2.8X6.$

Effective model, which reproduces the dynamics of quantity of internally displaced persons for the forecast of the financial support of the eastern region (Kharkiv, Dnipro, Zaporizhzhia, Luhansk, Donetsk regions) is presented below

East: $K_{VPO} = -0.95 - 0.15X1 + 0.88X2 + 0.98X3 + 0.09X4 +$

$+ 0.27X5 - 0.24X6.$

The economic-mathematical model that reproduces the dynamics of the quantity of IDPs for forecasting the financial

support of the southern macro-region, which includes the Kherson, Mykolaiv and Odesa administrative-territorial units, looks like this

South: $K_{VPO} = -0.55 + 0.41X1 + 0.84X2 + 1.07X3 + 0.41X4 - 0.59X5 - 0.37X6.$

An economic-mathematical model that reproduces the dynamics of the quantity of internally displaced persons for forecasting the need for financial resources of the region, which includes Sumy, Kyiv, Zhytomyr and Chernihiv regions, has the following form

North: $K_{VPO} = -2.43 + 0.55X1 + 2.13X2 + 1.79X3 + X4 - 0.13X5 + 0.46X6.$

Calculation of financial support for persons who are forced to change their place of residence is carried out taking into account the subsistence minimum in accordance with Resolution of the Cabinet of Ministers of Ukraine dated October 1, 2014 No. 505 (with amendments).

Information on the dynamics of changes in the subsistence minimum in Ukraine is given in Table 11.

The total amount of assistance per family is calculated in accordance with clause 3 of the Procedure for providing accommodation assistance to internally displaced persons, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 03.20.22 No. 332za, is constantly refined and adjusted [18, 19, etc.]

Taking into account the above, we consider it possible to calculate the sum of the macro-region's needs in funds for the provision of internally displaced persons according to the formula

$$FZ_{VPO} = ((1 - X2) \cdot 2 + X2 \cdot 3) \cdot Ch_{VPO} \cdot KP_{VPO},$$

where FZ_{VPO} is the macro-region's need for funds to support internally displaced persons, thousand hryvnias; Ch_{VPO} is the number of internally displaced persons in the macro-region as of the end of the reporting period; KP_{VPO} is the coefficient that takes into account the difference in financial needs of internally displaced persons from the needs of native residents of the macro-region (additional funds for renting and furnishing housing, purchasing basic necessities, etc.).

The results of the calculations are given in Table 12.

The amount of financial support of individual macro-regions needs to be adjusted since it is essential to take into account the needs of transit displaced persons. According to [15] as of July 6, 2022, about six million refugees from Ukraine are registered in European countries, in particular: in Poland — more than 1 million 207 thousand people, Germany — more than 867 thousand, the Czech Republic — more than 380 thousand, Turkey — about 145 thousand and Italy — more than 140 thousand forced refugees. About 90 % of them are women and children, who are most vulnerable to violence and abuse and are at increased risk of criminal offenses, including human trafficking, smuggling and illegal adoption [15].

Table 11

Living wage in Ukraine by social and demographic groups from 2014 to 2022 (UAH) [16]

Period	General indicator	Children up to 6 years old	Children from 6 to 18 years old	Able-bodied persons	Persons who have lost working capacity
from 01.01.2023	2589	2272	2833	2684	2093
from 01.01.2022	2393	2100	2618	2481	1934
from 01.01.2021	2189	1921	2395	2270	1769
from 01.01.2020	2027	1779	2218	2102	1638
from 01.01.2019	1853	1626	2027	1921	1497
from 01.01.2018	1700	1492	1860	1762	1373
from 01.01.2017	1544	1355	1689	1600	1247
from 01.01.2016	1330	1167	1455	1378	1074
from 01.01.2015	1176	1032	1286	1218	949
from 01.01.2014	1176	1032	1286	1218	949

Conclusions. During the period of military aggression, there is a decrease in state funding of certain regions of Ukraine for objective reasons. The main reasons for this are the disruption of economic relations, the impossibility of conducting business in the temporarily occupied territories and, as a result, the failure to collect taxes and fees from the state and local budgets. The forced relocation of large masses of the population to regions not affected by the war requires a review and adjustment of the amounts of interbudgetary transfers, provision of subventions and additional subsidies from the state budget to local budgets. The economic and mathematical models presented in the article reproduce the dynamics of the quantity of internally displaced persons based on statistical data from the representative survey. They can be applied in practice in the methods for calculating the financial needs of macro-regions, individual regions and settlements to forecast the number of forced migrants. Unlike the existing ones, they take into account the main factors that affect the internal migration of the population during the period of military aggression.

The method for calculating the forecast quantity of internally displaced persons proposed in the article allows timely adjustment of the components of economic and mathematical models, which contributes to increasing their reliability.

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Table 12

Calculated values of the needs of macro-regions in funds for the provision of internally displaced persons, thousand hryvnias

	May	June	Abs.	Relative	July	Abs.	Relative
Kyiv	768,240	1,752,015	983,775	1.28	1,709,700	−42,315	0.02
Center	6,226,974	6,631,625	404,651	0.06	7,047,261	415,636	0.06
West	6,131,568	5,213,088	−918,480	0.15	5,660,928	447,840	0.09
East	4,637,490	4,774,770	137,280	0.03	5,150,893	376,123	0.08
South	1,916,420	1,019,304	−897,116	0.47	2,067,879	1,048,575	1.03
North	3,844,885	2,013,352	−1,831,533	0.48	3,580,632	1,567,280	0.78

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Фінансове забезпечення макрорегіонів у період військової агресії

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Мета. Формулювання основних чинників, що впливають на внутрішню міграцію населення в період військової агресії, створення економіко-математичної моделі, яка відтворюватиме кількість внутрішньо переміщених осіб для прогнозу фінансового забезпечення макрорегіонів.

Методика. У дослідженні були використані загальнонаукові та спеціальні методи дослідження: метод критичного аналізу, наукової абстракції та узагальнення наукового досвіду сучасних теоретичних досліджень, методи статистичного аналізу, експертних оцінок, системно-комплексний підхід.

Результати. Визначені основні відмінності причин міграції громадян країни в мирний і у воєнний час. Окреслені фактори, що посилюють поведінкову невизначеність переміщуваних осіб. Запропоноване створення економіко-математичних моделей, що відтворюватимуть динаміку кількості переміщених людей для прогнозу фінансового забезпечення макрорегіонів за допомогою методу кореляційно-регресійного аналізу. Визначені змінні показники, що мають найбільший вплив на кількість новоприбулих на зазначених територіях.

Наукова новизна. Наведені у статті економіко-математичні моделі відтворюють динаміку кількості внутрішньо переміщених осіб на основі статистичних даних репрезентативного опитування. На відміну від існуючих, вони враховують основні чинники, що впливають на внутрішню міграцію населення в період військової агресії.

Практична значимість. Наведені у роботі економіко-математичні моделі можуть бути застосовані на практиці в методиках розрахунку фінансових потреб регіонів, окремих областей і населених пунктів для прогнозу кількості вимушених мігрантів. Запропонована у роботі методика розрахунку прогнозної кількості внутрішніх мігрантів дозволяє своєчасно коригувати складові економіко-математичних моделей, що сприяє підвищенню їх достовірності.

Ключові слова: *забезпечення фінансове, міграція, переміщені особи, макрорегіон, збройна агресія, фінансові потреби*

The manuscript was submitted 17.11.22.