

<https://doi.org/10.15407/scine19.03.048>

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INNOVATIVE EMPIRICS OF MIGRATION-ECONOMIC SECURITY CAUSAL NEXUS

Introduction. *In the context of spreading dynamic globalization processes, migration as a natural phenomenon and an existential sign of Ukraine's development has become critical, which negatively affects the resource provision of the country's economic growth.*

Problem Statement. *Migration (intellectual, educational, labor, stationary) deepens socio-demographic problems (depopulation of settlements, decrease in labor potential, decapitalization of determinants of human development, disappearance of the middle class), is a risk to economic security through the loss of intellectual and human, financial and investment, innovation and technological resources.*

Purpose. *The purpose is to determine the relationship between different types of migration and economic security, to identify critical levels and to model the effect of migration processes on the economic security of Ukraine.*

Material and Methods. *The critical volumes of migration processes (domestic, international, labor, and educational), the nature of their influence on the parameters of economic security of Ukraine have been estimated on the basis of nonlinear econometric models with the use of the temporal and spatial approach.*

Results. *The critical migration volumes have been determined: 50 thousand people for educational emigration, 120–150 and 218–235 per 100,0 thousand people for internal migration, and 0.501–0.575 for international migration. In Ukraine, the current levels of migration exceed the critical ones, as a result of a low controllability of migration processes and the underuse of the migration potential for the development and strengthening of the economic system.*

Conclusions. *Structural changes in migration processes adversely affect the economic system stability and contribute to the emergence of new and the spread of the existing risks to the national economy security.*

Keywords: *migration, structure of migration, threshold values, intensity, security, threats, and Ukraine.*

Citation: Mulska, O. P., Vasylytsiv, T. G., Kunytska-Iliash, M. V., and Baranyak, I. Ye. (2023). Innovative Empirics of Migration-Economic Security Causal Nexus. *Sci. innov.*, 19(3), 48–64. <https://doi.org/10.15407/scine19.03.048>

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The current socio-economic situation in Ukraine and the EU policy of attracting immigrants in conditions of ageing population and declining workforce, including the aggravated problems of demographic reproduction, have fostered the intensification of international labor, educational, academic, permanent migration and youth migration from Ukraine, especially in the border areas. The international migration in Ukraine is the determinant of structural reform of the national economy, the transformation of cultural values, and the redistribution of human capital, as well as personal values, changes in the reproductive behavior of the population, and growing imbalances in the gender-age structure of residents. The current international migration trends endanger the national and economic security of Ukraine. There has been a negative effect of the migration on the development of labor capacity, output and sales, maintenance of intellectual and personnel security, and competitiveness of scholarly research and educational as well as innovation and technology activities of the state.

A set of migration vectors from the donor region in Ukraine to EU countries generate migration networks. Their development depends on security factors, socio-economic and political stability, level of market shocks dissemination, structural changes in the economy, and regional development. The key *problem aspects and new risks for keeping the national economic security in Ukraine*, which emerge as a result of the migration processes intensification in the border areas are as follows: (1) declining intellectual and personnel security of the territory under the active migration and the economic policy of the EU countries focused on the creation of favorable conditions to attract human resources and to align demographic imbalances on the internal labor market; (2) declining financial security in the country as a result of growing dependence of regional economies on transfers and a low level of foreign and capital investment attraction, which lead to increasing uncontrolled financial flows, shadow economy, and corruption; (3) a lack of demographic resili-

ence because of aggravated problems of demographic reproduction, the falling number of people of reproductive and economically active age, and the limited educational and family demoreproductive functions; (4) falling productive security of the country due to depletion of personnel and production occupations leading to the deficit of workers and falling labor productivity and thus industrial output.

In the context of the spread of dynamic globalization processes, migration is a natural phenomenon and an existential feature of the development of all countries of the world. This phenomenon is considered mainly in a positive sense as a trend that contributes to the growth of population mobility, the rational placement of human and labor capital within regional megasystems, for example, the EU [1], the settlement of disparities in the internal labor market and labor force, the accumulation and import of knowledge, technologies, private investments aimed at intensifying the entrepreneurial activity [2].

However, like most macroeconomic processes, migration requires its proper control, limitation and containment of scale, preservation or change of structure. Otherwise, there are developing trends that are destructive for both the person that migrates and the country as donor of human resources. The lack of active scholarly research and socio-economic (on the one hand) and protectionist (on the other hand) policies lead to an increase in the intensity of migration (and vice versa) with negative consequences of increasing the social burden on budgets due to the expenditure on refugees [3], loss of internal intellectual and human resources of the highest quality and productivity [4], development of socio-economic problems in the territories of intensive international migration activity [5], human rights violations [5], actualization of the problems of slavery, human trafficking, forced and partially illegal employment [7], socio-spatial disintegration of the country and regions [8].

One of the signs of “migration” and “security” phenomena similarity is the so-called polarity

factor, in other words, opposition. Differences between countries (regions) in the quality of life, working conditions, wage/salary, etc. increase migration aspirations; similarly, the lag in the pace of economic development exacerbates the issue of the security of the national economy. The relevant relationships have been sufficiently studied by the example of the Scandinavian countries, in terms of immigration and welfare [9], labor migration and labor market security [10].

The outlined consequences (often the causes) of migration processes lead to a weakening of the stability and stable viability of socio-economic systems, but develop into critically destructive security factors when they affect uncontrolled processes of human mobility [11], threats to national identity and security [12], significant weakening of the human potential of the nation as a result of the action of powerful factors of the pull-environment of migration [13], deterioration of key structural characteristics of the economic and resource potential of the state [14, 15], reverse migration of immigrants and returnees after emigration, as well as the development of social, humanitarian and social problems. Because, the well-known and minor, at first glance, trends and threats to the national economy security are provoked mainly by migration displacements and further develop into human and humanitarian security issues [16], crime [17], and food security [18] problems.

Since 2021, the modern world has faced another existential security challenge at all levels — from person to civilization, which is also closely related to global and regional migration processes — Covid-19 as a loss of job and income [18], curbing human and social mobility [19], and, because of this, the deterioration of human capital quality, the emergence of imbalances in the internal markets of individual countries due to difficulties in the supply of labor from abroad [20], complications of institutional, organizational, and legal aspects of regulation of migration and labor relations, including between the regions of Europe [21].

Close links between migration and security can be clearly seen by the example of the Ukrain-

ian economy, where international migration processes, in particular intellectual, labor and impatient migration of young people (families), as well as the latest forms of business migration, intellectual property and technology have acquired critical volumes that threaten the sustainable development of the national economy through deepening socio-demographic disparities (depopulation of settlements, reduction in demographic and labor potential, decapitation of determinant of human development, deepening of social inequality, devaluation of education, disappearance of the middle class), loss of resource support (intellectual and personnel, financial and investment, innovation and technological) [22], and destabilization of the processes of economic reproduction and revival [23–25].

The systemic and long-term consequences of the negative effect of critical volumes and structurally imperfect migration processes have been analyzed in [26] (destruction of families and depopulation of territories), an in [27] (the use of migration to undermine the principles of international, regional stability and security, man-made disasters, environmental crises, and environment degradation).

The mentioned relationships and mutual influences naturally strengthened at the end of 21st century. and especially at the beginning of 21st century. The intensification of scholarly research in the field of migration and its consequences becomes powerful determinants for not only the economic security of the state, but also for the national security of the country. The new theories of security have been developed (considering the factor of international migration displacements and migration (for reasons of habitat safety); the new paradigm has been established [28]; the foundations of state security in the globalization environment have been formed [29]; increasing mobility and intensification of migrations of the world population, internal displacements have been reported [30]; hybrid challenges and threats have been identified etc. Modern substantive research in the field of migration and security of

Eastern European researchers deals with the development of management decisions in line with the policy of emigration regulation [31] and international migration [32], directing migration capital into investments, creating new jobs in mobile competitive areas, in particular in the IT sector [33], strengthening human mobility [34], innovative approaches to the development of human capital [35], multi-level tools for strengthening the security of a person, business entity, state by building a common policy and responsibility for the preservation of human and labor migration aspirations [36], increasing household well-being as a significant factor in curbing citizens' migration intentions and preserving the integrity of families [37].

The need to intensify and improve the tools for state regulation of migration in the context of globalization of the competitive landscape is due to the need to ensure a more manageable course of international migration processes and the use of the potential of internal migration and migration flows to ensure the economic security of the country, its territories, and the formation of an effective policy for regulating migration remains perhaps the most urgent security challenge in such modern realities.

However, the adoption of rational management decisions in this area (including considering the mutual effects of migration and security) is based on the necessary regulatory, methodological, and information-analytical support, capable of systematizing modeling (including the functions of analysis, forecasting, planning, monitoring and control) of connections in the "migration ↔ security" system. Rahman [38] assessed the effect of migration on national income parameters; Berezhivskiy [39] analyzed the effect of migration on several characteristics of the internal market, in particular network trade; Ilyash [40] modeled the relations of personnel support of enterprises, industrial and technological development, and economic security of the state. Further development is taken care of, especially in terms of modeling the effect of different types and types of migration on the integral

index of economic security in the relevant environment, state, dynamics and structure of migration processes (on the one hand) and the characteristics of the economic security of the state and its components (on the other hand).

The purpose of this research is determining the relationship between migration (internal, general international, labor, and educational) and the economic security of the country, identifying critical levels, and modeling the effect of migration processes on the economic security of Ukraine.

In Ukraine, there is no statistical accounting of internal migration "village-city", there are no special selective surveys of the population regarding pendulum and stationary migration within the migration vector "rural-urban area". The introduction into practice of such studies on an ongoing basis (within the framework of national and regional surveys) will contribute to the creation of an information base on internal labor migration, socio-demographic characteristics of migration flows, which will effectively form and implement migration management policies and mechanisms for balancing regional labor markets. Such surveys can serve as an information and analytical basis for the formation and development of a system of regional monitoring of labor migration processes in Ukraine. In particular, the available statistical information on the number of settlements departed and arrived by type does not allow for a comprehensive analysis of the structural and dynamic characteristics of the migration corridor "rural-urban territory", therefore, forms a methodological gap in the process of identifying the effect on the security of the national economy and regional socio-economic systems.

The scale of migration flows "rural area-urban area" can be calculated with the use of (1). The proposed formula allows us to calculate the volume of stationary migration from rural to urban areas in Ukraine in dynamics, intraregional and interregional sections.

$$\begin{aligned} Migr_t^{vt} = MigrInf_t^t - \\ - MigrOutF_t^v - \sum F Migr_t^{vt} \end{aligned} \quad (1)$$

where $Migr_t^{vt}$ is the volume of migration flow “rural area-urban area” within period t ; $MigrInf_t^t$ is the total number of arrivals in urban areas in the t period; $MigrOutF_t^v$ is the total number of departures from rural areas in the t period; $FMigr_t^{vt}$ is the total number of departures abroad from rural and urban areas in the t period.

To detect the threats of growing migration processes to the national economy, the research models the effect of intensity of internal, general international, labor, and educational migration on the integral parameter of economic security of Ukraine. Among economic-mathematical models, only those with the highest reliability estimations and minimum error were selected.

The effect of educational migration on the level of economic security in Ukraine is described by the piecewise linear function (2):

$$ES_t^{intg} = \begin{cases} a \frac{EMigr_t}{(ES)} + \frac{b}{(ES)}, & IMigr < LQ \\ a \frac{EMigr_t}{(ES)} + \frac{b}{(ES)}, & IMigr \geq LQ \end{cases}, \quad (2)$$

where ES_t^{intg} is integral indicator of economic security of the country in the t period; $EMigr_t$ is level of international educational emigration intensity in the t period; ES is the level of statistical error; LQ is internal migration criterion (critical range).

The sinusoidal model is the economic-mathematical model for internal (3) and labor (4) migration, which shows the causal relationship between migration processes and economic security level. The internal migration intensity level is calculated as gross internal migration per 100,000 of the people. Labor emigration intensity level is calculated as the number of citizens employed abroad per 1,000 departures.

$$ES_t^{intg} = \frac{a}{(ES)} + \frac{b}{(ES)} \cos\left(\frac{c}{(ES)} IMigr_t + \frac{d}{(ES)}\right), \quad (3)$$

$$ES_t^{intg} = \frac{a}{(ES)} + \frac{b}{(ES)} \cos\left(\frac{c}{(ES)} LMigr_t + \frac{d}{(ES)}\right), \quad (4)$$

where $LMigr_t$ is labor emigration intensity level in the t period; $IMigr_t$ is the internal emigration intensity level in the t period.

The dependence of the integral index of economic security in Ukraine on the international migration intensity level is described based on the polynomial regression, degree 3 (5). General migration intensity level is calculated as the number of departures to the number of people ratio.

$$ES_t^{intg} = \frac{a}{(ES)} + \frac{b}{(ES)} GMigr_t + \frac{c}{(ES)} GMigr_t^2 + \frac{d}{(ES)} GMigr_t^3, \quad (5)$$

where $GMigr_t$ is international migration intensity level in the t period.

STRUCTURAL ASPECTS OF MIGRATION PROCESSES IN UKRAINE: PROJECTION OF THREATS TO NATIONAL ECONOMIC SECURITY

Rural-urban migration vectors. Urbanization processes are among the main features-causes of migration in Ukraine. Financial and socio-economic deprivation in rural areas, low level of social protection, and development of informal employment and precariat with low wages are the major push-factors of the emergence and development of this migration vector. Rural-urban vectors lose the features of seasonal and commuting ones by form and terms and become irreversible permanent migration to urban areas. The development of urban area-administrative center or capital vector is caused by a large number and diversity of job offers in labor markets of large cities and their attractiveness due to high labor remuneration and opportunities for professional development of internal migrants. These migration vectors represent the global urbanization trends. It is worth emphasizing that the developed transport infrastructure boosts commuting, while poor transport infrastructure — permanent migration.

Permanent migration to cities was the lowest in 2016, which was caused by worsening economic cri-

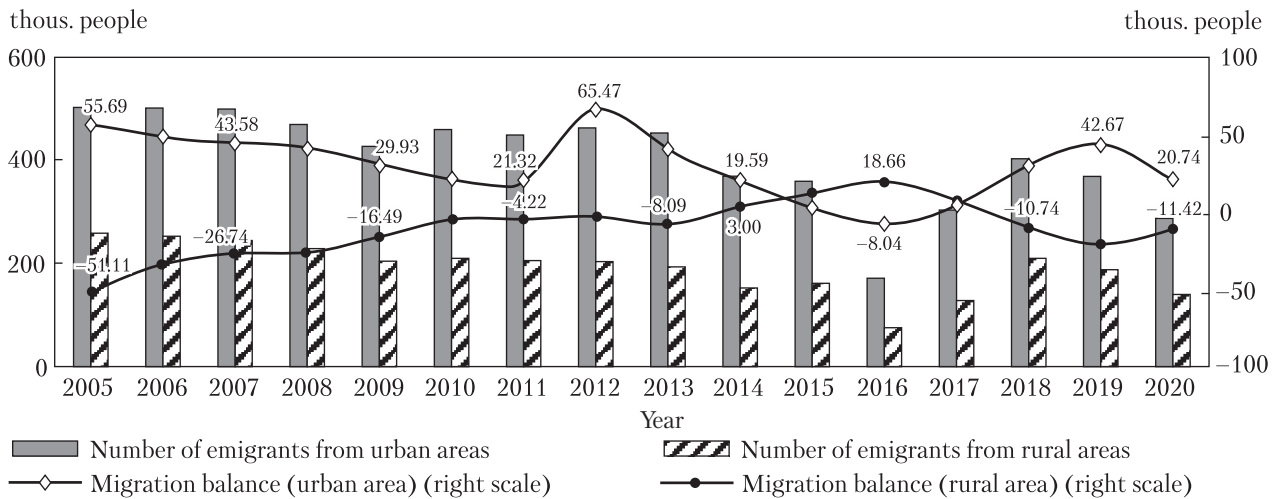


Fig. 1. General migration flows by the type of area: number of emigrants and migration balance, 2005–2020

Note: 2014–2020 – excluding the temporarily occupied areas of AR Crimea and a part of temporarily occupied areas in Donetsk and Luhansk Oblasts.

Source: based on the data [41].

sis in Ukraine, and 2020 due to the spread of the Covid-19 pandemic. Interestingly, urban-rural areas temporary migration corridors were developed in 2020–2021 in conditions of quarantine restrictions.

The dynamics of general migration processes from urban areas prevails at a 7:3 ratio to migration processes from rural areas. The number of people leaving urban areas in 2020 was over 286,000, while that from rural ones totaled 139,000 (Fig. 1). The net positive migration in urban areas shows the attractiveness of the areas for migrants as the migration flow balance was negative only in 2016 and amounted to –8,040 people. Meanwhile, the migration balance in rural areas in 2005–2020 remained negative (excluding 2016).

The development of rural-urban areas migration vectors leads to depopulation of villages and thus their extinction, as well as an overload of social infrastructure in large cities that causes increased pressure on local budgets. The migration of youth from rural areas is caused by a falling birth rate, devaluation of school education, and lack of human resources for the development of agriculture and agribusiness.

The current state of international migration in Ukraine shows that Ukraine has become one of

the main transit countries on the way of migration to EU countries due to its geographical location. Meanwhile, the difficult economic situation has turned Ukraine into one of the largest donor countries of human resources, especially for neighboring countries. Therefore, the high migration activity of the population in border areas is a challenge for public migration processes management policy. According to the State Statistics Service of Ukraine, across regions, the oblasts of Western Ukraine had the leading positions by the scope of migration processes in 2008–2017. Carpathian region occupied a special place among them (Ivano-Frankivsk, Lviv, Chernivtsi, and Zakarpattia Oblasts) as the leader by international labor migration intensity in Ukraine. The intensity of international migration in the western oblasts of Ukraine was 10 times higher than the average rate in four other economic zones of the country, which was 1.29% of the permanent population aged 15–70. Over 69% of migrants from Ukraine in 2017 were residents of western Ukraine. About 17.0% and 16.0% of the total number of migrants were from Lviv and Zakarpattia Oblasts. Ivano-Frankivsk and Chernivtsi Oblasts accounted for 11.0% and 7.5% of migrants. Taking into account the number

thousand people

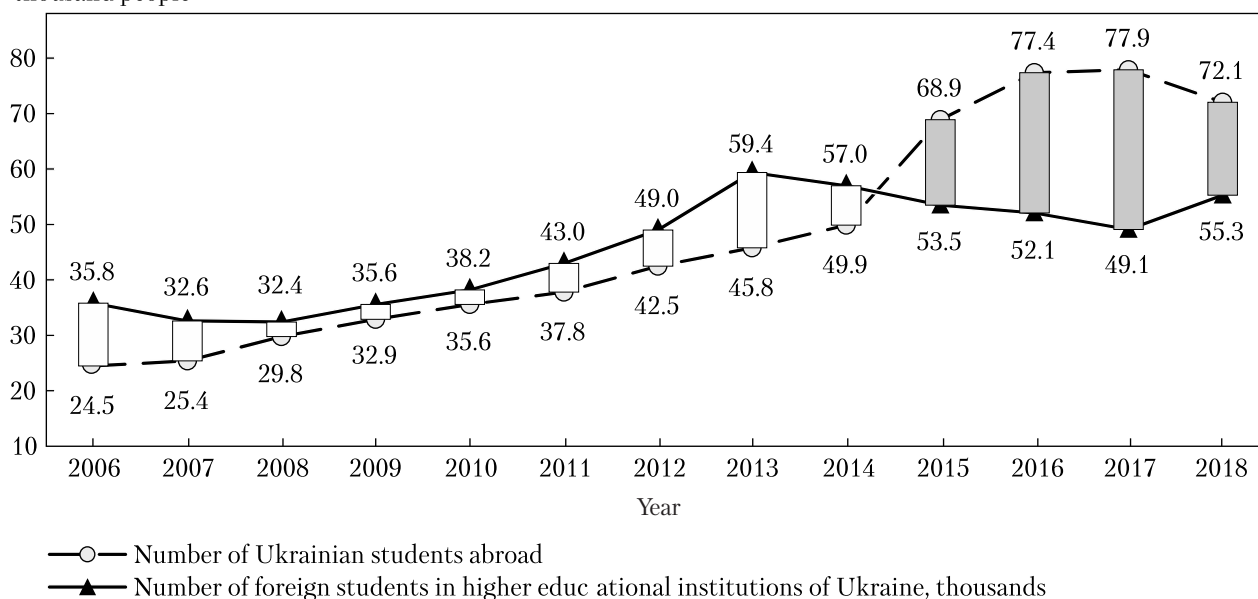


Fig. 2. Educational migration in Ukraine: Ukrainian students abroad and foreign students in Ukraine, 2006–2018

Note: 2014–2020 — excluding the temporarily occupied areas of AR Crimea and a part of temporarily occupied areas in Donetsk and Luhansk Oblasts.

Source: calculated based on the data [43].

of permanent people in the oblasts, the population of Zakarpatska Oblast was the most active in migration. The level of international migration aged 15–70 was over 20%. In Chernivtsi Oblast, the rate was 13%, in Ivano-Frankivsk, it accounted for 12%, in Lviv, it made up about 11%.

The volumes of international migration in the Carpathian region of Ukraine are quite significant and tend to grow. According to the official statistics, the largest share of migrants from the Carpathian region in 2016–2019 moved to Hungary, Poland, and the Czech Republic, as well as to Germany, Italy, and Spain. The results of structural analysis verify the hypothesis about the existence of the system of migration vectors with neighboring countries, namely Zakarpattia Oblast-Hungary, Lviv Oblast-Poland, and Chernivtsi Oblast-Moldova. Interestingly, a significant intensity of migration from these oblasts, economic cooperation, and the mental, political, and geographic affinity of border areas are the causes of development of micro-migration vectors. It is

worth adding that the emergence of Lviv Oblast-Nigeria and Chernivtsi Oblast-India migration vectors is stipulated by the educational remigration of foreign students studying in higher educational institutions of the Carpathian region.

Educational migration. Lately, the intensity of educational and academic migration seen by youth as a special “social lift” has much increased. Education, training, or other forms of academic mobility are the bridge factors of prolonging educational migration into the labor emigration form. Most often, educational migration to Poland and the Czech Republic is transitional for Ukrainian students for permanent migration to other EU countries. According to CEDOS, about 78,000 students from Ukraine studied in higher educational institutions of the EU countries in the 2017/2018 academic year, including in Poland — over 30,000 students or 55% of all foreign students in the country with only 9% of them planning to return to their home country, 28% going to stay in Poland, and 29% considering Poland as

a transit country to the countries with better conditions [42]. In 2013–2019, the net migration balance of students to Poland was 17,500, which was the most substantial in size educational migration vector among all migration corridors to EU countries. In the period under research, the migration of students to the Czech Republic increased 1.9 times, while that to Slovakia grew 12.3 times. Interestingly, the educational migration to Great Britain and Italy declined in 2013–2019 by 93.8 p.p. and 25.5 p.p., respectively.

It is worth mentioning that in 2006–2014, the number of foreign students in Ukraine exceeded the Ukrainian ones abroad (Fig. 2). Due to complicated security and socio-economic situation, educational emigration has been increasing since 2014, yet, in the 2018/2019 academic year, the number of foreign students in higher educational institutions in Ukraine started to increase and amounted to over 55,000 people. Most of them were the citizens of India (19.7%), Morocco (9.9%), Azerbaijan (8.2%), and Tadjikistan (5.3%). Medical business and pharmacy were the most popular educational directions among foreign students.

Uncontrolled educational migration causes growing losses of human capacity, worsening demographic and social risks in the country, and weakening demographic security. Meanwhile, the growing attractiveness of the educational environment in EU countries actively pursuing foreign students has contributed to the outflow of talented youth and professional staff and emigration of young researchers. According to CEDOS, the number of PhD students from Ukraine was 1,600 in the 2015/2016 academic year. Germany (525 people), Poland (380), the Czech Republic (223), France (201), and Switzerland (105) were the most attractive EU countries for getting a degree. It is worth emphasizing that statistical data on Ukrainian citizens engaged in post-graduate studies abroad (PhD programs) is limited.

Migration age breakdown. Demographic security and innovative-technological development of Ukraine depend on maintenance, reproduction, and efficient use of human capacity. Meanwhile,

the extremely high level and fast spread of positive migration aspirations, especially among youth, acquire new threatening forms and lead to the increase in migration losses in Ukraine. In particular, according to the International Institute for Education, Culture, and Diaspora Relations, two-thirds of Kyiv Polytechnic University and Lviv Polytechnic University students would like to study abroad. The most desired countries for study are Poland and Great Britain (for Lviv Polytechnic University students, 29.4% and 29.0%, respectively), Germany and the USA (for Kyiv Polytechnic University students, 45.8% and 25.9%, respectively) (Klyuchkovska & Pyatkovska, 2017). A high level of positive migration aspirations is confirmed by the results of sociological research of higher education and vocational education institutions and school graduates in the Carpathian region conducted by the Institute of Regional Research Named after M.I. Dolishniy of the NAS of Ukraine in 2019. 25% of respondents tend to leave abroad for permanent stay and 13% for education (Vasylytsiv, 2020).

Educational migration, same as youth migration, is a threat to the national security of the country because uncontrolled volumes of migration processes and lack of reverse migration led to the deterioration of intellectual and personnel security, aggravation of demographic reproduction problems, ageing of the population, inefficient use of human capacity, and falling human development paces. The share of youth in the total migration processes in 2015–2020 exceeded 50%, excluding 2016 (45.6%) (Fig. 3). The trend shows the “rejuvenation” of Ukrainian migration that has mostly economic causes, including the low level of human capacity capitalization opportunities.

An issue of naturalization of Ukrainians. The decreasing number of the people is observed in many EU countries (falling birth rate and high share of people of retirement age), leading to a growing deficit of personnel and a systemic crisis in the labor market. Therefore, some countries develop and implement the policy of migrant’s attraction (conditionally managed processes) to

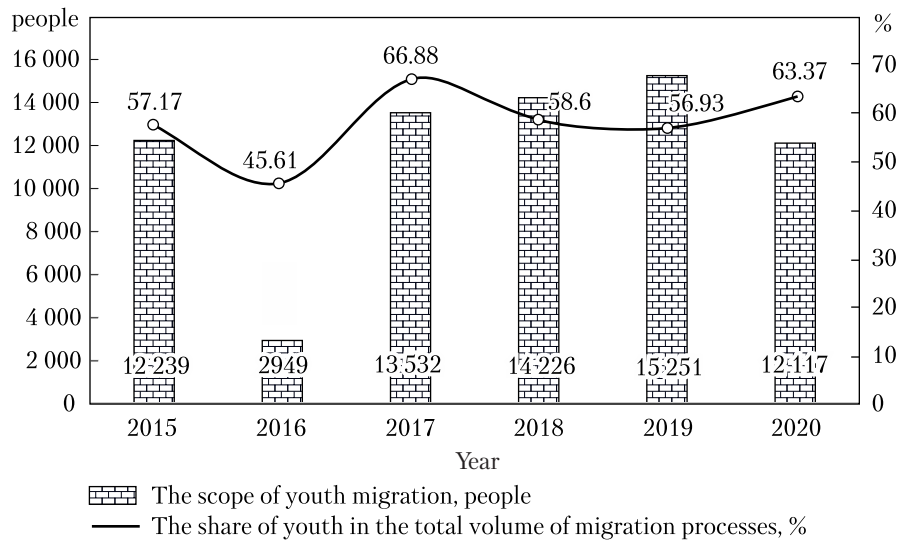


Fig. 3. The scope of youth international migration processes in Ukraine, 2015–2020
Note: calculated as the number of people leaving the country at age 15–35; excluding the temporarily occupied areas of AR Crimea and a part of temporarily occupied areas in Donetsk and Luhansk Oblasts.
Source: calculated based on the data [41].

increase the share of naturalized citizens, including from Ukraine. According to Eurostat, the largest number of Ukrainian citizens were naturalized in the EU territory in 2012–2014, namely, over 30% of emigrants from Ukraine in 2012–2014 became citizens of the EU countries. About 10% of naturalized people have been accounting for the total number of emigrants from Ukraine lately. The scope of naturalization of Ukrainian citizens in the EU territory shows the high level of demographic losses, which endanger the national security of a country.

Ukraine has been the transit country for illegal migrants to the EU countries for a long run. According to the data of the State Border Guard Service of Ukraine for recent years, the number of illegal migrants crossing the territory of Ukraine is increasing. From 11,300 to 24,800 people were refused to enter Ukraine in 2005–2007. The problem of unregulated migration of foreigners to Ukraine remains to be relevant. In 2019, 9,800 people were detained when trying to cross the state border, while the number of migrants in Ukraine was

11,100 (Fig. 4). Starting from 2014, the scope of immigration processes in Ukraine has been increasing annually. In 2019, 285,000 immigrants with official permits stayed in the territory of Ukraine.

Immigration in Ukraine. The following are the causes of growing immigration flows in Ukraine: a growing number of foreign students employed in the country after graduation; specifics of Ukrainian legislation regarding the legalization of illegal migrants in the territory of the country; a growing number of foreigners applying for refugee status in Ukraine after the legal assistance from NGOs; development of national diasporas and foreign businesses in Ukraine that foster the migration of their countrymen (Chinese, Vietnamese, Hindu, and Afghan diasporas are the most developed and active).

Uncontrolled immigration processes effect the labor market by increasing the deficit of job offers and pressure on social components of the country's budget and serve as threats to national security due to the growing possibility of the emer-

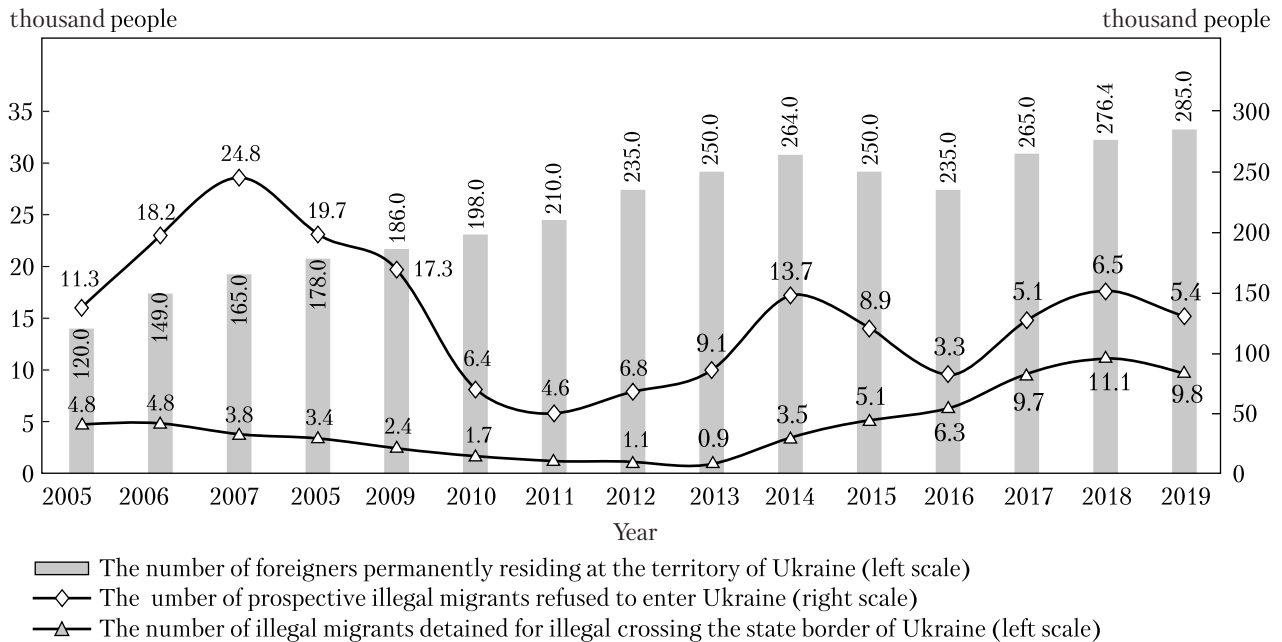


Fig. 4. The scope of immigration in Ukraine: regulated and illegal, 2005–2019

Note: 2014–2020, excluding the temporarily occupied areas of AR Crimea and a part of temporarily occupied areas in Donetsk and Luhansk Oblasts.

Source: calculated based on the data [44].

gence of terroristic acts, provocative actions, and aggravated ethnonational conflicts.

Internally displaced persons. The annexation of the AR Crimea and military conflict in the east of Ukraine have caused the emergence of new internal migration flows – internally displaced persons (IDPs), which were the most numerous in 2014–2015. Forced migrations differ from other migration processes directed at the improvement of financial condition in the fact that they cause the loss of social status and a declining level of migrants' wellbeing. Interestingly, in 2017–2020, these processes got stabilized, as there was no increase in the number of IDPs. In 2019, 1.4 million people were registered by social security authorities, including 500,000 in Donetsk Oblast, 300,000 in Luhansk Oblast, and 200,000 in Kyiv and Kyiv Oblast. Kharkiv, Dnipropetrovsk, and Zaporizhzhia Oblasts also were attractive for IDPs. Excessive concentration of IDPs in some regions increases the pressure on social infrastructure, la-

bor market, and housing system. In 2020, retirees prevailed among IDPs. Their amount was about 700,000 people and 200,000 children.

According to the National System of IDP Situation Monitoring, the family income of IDPs is 30% less than the average national rate. A significant share of IDP families receives governmental financial assistance because their disposable income per capita is below the actual subsistence level calculated by the Ministry of Social Policy of Ukraine. Growing IDP flows endanger national and economic security because the readiness to react to these displacements of socially vulnerable groups in Ukraine was minimal, including the timeliness and efficiency of solving the tasks of IDP social security in current dynamics. The problem of securing housing and employment has become the most acute for the country. Considering the labor-surplus regional labor markets in Ukraine, IDP employment was low, but according to the survey data,

it amounted to 46% as of 2019, which was 9 p.p. less than in Ukraine overall.

MIGRATION AND SECURITY: MODELING THE EFFECT

It is worth mentioning that the effect of educational migration on the economic security of Ukraine is inert and is determined by the length of students' stay abroad, a significant share of which would not ever become re-emigrants and will move to the cohort of permanent migrants in EU countries. In this case, a reducing level of economic security is observed at a point of 50,000 people (in 2019, the volume of educational migration exceeded 70,000 people), which can be seen as critical for the resilience of the Ukrainian economic system (6):

$$ES_t^{intg} = \begin{cases} -0.002 \frac{EMigr_t}{(0.007^*)} + \frac{0.542}{(0.026^*)} \\ -0.0003 \frac{EMigr_t}{(0.0023^*)} + \frac{0.489}{0.176} \end{cases}, \quad (6)$$

$$IMigr < 50$$

$$IMigr \geq 50$$

$$R^2 = 0.695 \quad AICC = -100.733$$

Economic and mathematical modeling (7) has shown the wave-like effect of internal migration on the economic security level. The critical values of interregional migration processes in Ukraine range within 120–150 and 218–235 displacements per 100,000 of people. It verifies the thesis on the unbalanced regional markets of the country. Their balance depends on the ratio of outflow-inflow of human resources in regional economies. Interestingly, the creation of jobs and infrastructure development will boost the replacement of international migration with internal one, will have positive effects on the development of the economic system, and thus will secure its resilience.

$$ES_t^{intg} = \frac{0.473}{(0.006^*)} + \frac{0.032}{(0.009^*)} \cos \left(\frac{0.074}{(0.036^*)} \right. \\ \left. IMigr_t - \frac{0.687}{(0.813^*)} \right), \quad (7)$$

$$R^2 = 0.871 \quad AICC = -40.43$$

The falling level of economic security in Ukraine is observed at 2.0 and 2.4 labor migration intensity levels. The model of labor migration effect on the economic security is described by the sinusoidal model, which shows the cyclical nature of the relationship between labor migration and economic security components. Growing economic security is observed at a low migration intensity and vice versa. The critical range of the labor migration intensity level is within 2.1–2.25, when the economic security level of the country is 0.45 and is the lowest coefficient in the period under research (8):

$$ES_t^{intg} = -\frac{0.477}{(0.004^*)} + \frac{0.026}{(0.005^*)} \cos \left(\frac{13.896}{(0.726^*)} \right. \\ \left. LMigr_t + \frac{4.245}{(1.558^*)} \right), \quad (8)$$

$$R^2 = 0.837 \quad AICC = -87.885$$

The effect of international migration on the economic security of Ukraine (9) is determined at a 74.8% level with a 90% probability. 0.501–0.575 is the critical range of international migration intensity level when the economic security level has a minimum value (0.456–0.459). The constructed economic-mathematical model verifies the hypothesis that Ukraine will face significant losses with a growing level of international migration intensity, leading subsequently to deteriorating economic security, including macroeconomic, social, food, and investment-innovative components.

$$ES_t^{intg} = -\frac{10.316}{(7.316^*)} + \frac{84.691}{(57.918^*)} GMigr_t - \\ - \frac{244.365}{(168.269^*)} GMigr_t^2 + \frac{307.336}{(214.173^*)} GMigr_t^3, \quad (9)$$

$$R^2 = 0.748 \quad AICC = -71.953$$

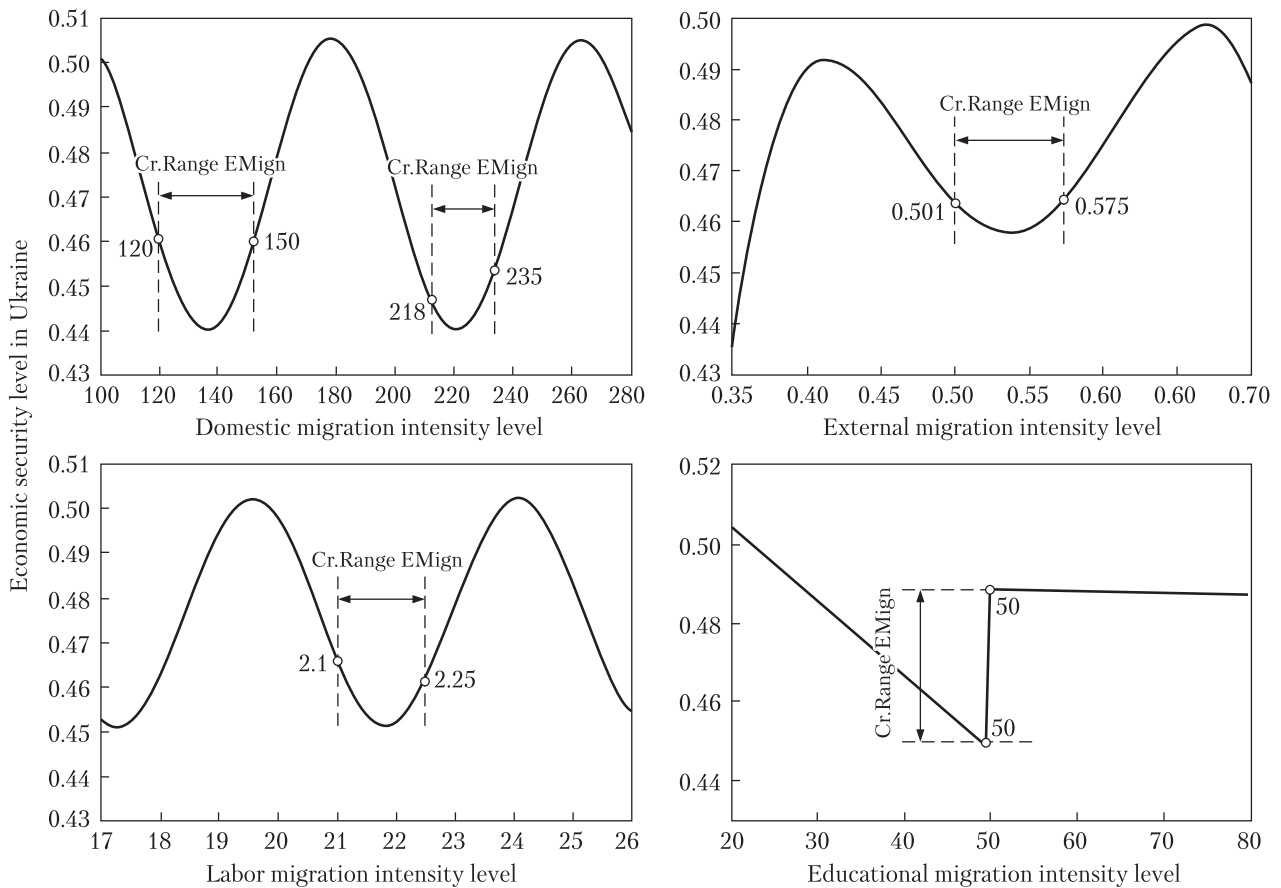


Fig. 5. Effect of migration on the economic security of Ukraine: critical volumes of migration processes, 2007–2019

Note: ES_t^{intg} is integral parameter of economic security in the t period; $EMigr_t$, $GMigr_t$, $LMigr_t$, $IMigr_t$ is intensity level of international educational, general, labor, and internal migration in the t period; *Cr. Range* is critical range of migration; the models are constructed in *Curve Expert Professional 2.6.3* software.

Figure 5 shows the visualization of critical levels and modeling of the effect of migration processes on the economic security of Ukraine. Migration processes, internal and international ones, effect the demographic situation and socio-economic system in Ukraine. Permanent migration processes affect the development of labor capacity, industrial output and sales, innovations and technologies, maintenance of intellectual and personnel security, development of capital and intellectual property market. These determinants endanger economic security and boost the development of unbalanced labor markets and a low level of social transfers capitalization. Interest-

ingly, the intensification of uncontrolled migration processes in Ukraine generates new and fosters the dissemination of existing negative consequences in the system of national economic security maintenance.

Therefore, immigration, especially illegal one, is characterized by a high social vulnerability for a country. The temporary stay of illegal migrants in Ukraine as the transit country fosters the expansion of socially vulnerable groups of the population. It is worth mentioning that the spread of assimilation culture, the transformation of the composition of the population, internal conflicts between some population cohorts, and the deep-

ening of various types of deviant behavior are the real threats to the country's national security.

The uncontrolled internal migration processes lead to the growing financial and socio-economic asymmetries of regional development, the emergence of new "depressed" areas, "extinction" of villages, the emergence of regional labor market imbalances, growing single-industry specialization of regions, growing social deviations (dissolution of marriages, orphanhood), development of illegal migration services market, growing pressure on the national labor market and social domain, growing precariat group, growing budget deficit, declining tax revenues, etc. The correlation analysis shows the direct favorable effect of internal migration on macroeconomic and financial components and the reverse effect on social, demographic, and food components of the country's economic security.

Threats to economic security of the state from uncontrolled migration processes are: (1) internal (growing financial and socio-economic asymmetries of regional development; emergence of new "depressed" areas (consolidated territorial communities, districts, regions); "extinction" of villages; imbalances in regional labor markets; growing single-industry specialization of regions; worsening demographic crisis; increasing social deviations (dissolution of marriages, orphanhood)); (2) immigration (emergence of criminogenic groups specializing in the illegal migration of people and human trafficking; development of illegal migration services market; increasing deviant behavior (alcoholism, drug addiction, prostitution); emergence of conflict situations and aggravated ethnonational contradictions between local people and immigrants; growing pressure on the national labor market, social domain; increasing precariat group); (3) emigration (loss of labor capacity of the state, lack of demographic resilience; decreasing intellectual security; deficit of professional staff in strategic technology-intensive and strategic industries; lack or low level of technological change; expansion of dual citizenship; decreasing financial security due to growing level of

uncontrolled financial flows; growing budget deficit, falling volumes of tax revenues. It is worth mentioning that the demographic component of economic security has a strong reverse relationship with youth and labor migration due to the washout of human resources that prevents the maintenance of demographic resilience in Ukraine. Immigration can foster the overcoming of demographic crisis and aligning the structural imbalances in the labor market, yet the volumes of immigration in Ukraine are not sufficient for this. All migration forms (excluding youth migration) have the reverse relationship with social and investment-innovative components of economic security.

International and internal migration processes decrease the number of active professional youth, scientific capacity, and labor resources, affecting the resource framework of innovative activity and weakening the technological competitiveness of the country. Educational migration boosts energy, food, foreign economic, and productive components of the economic security of the state. Having received education abroad, the students acquire a significant social capital that fosters the development of foreign economic links and increases social transfers. Meanwhile, general international emigration affects macroeconomic stability and resilience of the financial system because economic dependence on remittances increases and the investment attractiveness of the country declines. Migration processes of recent decades have boosted the spread of European values in Ukraine and have generated an innovation-based economy and growing competitiveness in the global labor market. Labor emigration is a tool and regulator of employment development it decreases the pressure on unemployment. Because migrants' labor remuneration abroad is several times higher than in Ukraine, migration is a tool to reduce the social inequality. Intellectual migration and youth migration multiply the effect on socio-economic development, including GDP, investment activity, small business growth paces, innovative capacity development, the competitiveness of tech-

nological-innovative and educational-scientific domains, and the national economy overall.

The analysis of structural features of migration processes in Ukraine across their directions (internal / international; rural-urban settlements), volumes and geography intensity, types (educational, age-related, in terms of naturalization), and causes (internally displaces persons) has allowed identifying the threats to the economic security of Ukraine (as country with a high international migration, especially the labor one, and an average economic development and social wellbeing). The most critical threats include “extinction” of villages, aggravation of demographic crisis, development of illegal migration services market, decrease in the intellectual security, technological regress, and deterioration of financial security due to growing uncontrolled financial flows, etc.

The research has shown the directions and strength of the effect of internal, general international, labor, and educational migration intensity on the integral parameter of economic security in Ukraine. The extreme migration indicator values

leading to the most critical devastating consequences for the system of state economic security have been identified: 50,000 people for educational emigration; within 120–150 to 218–235 interregional displacements per 100,000 people, for internal migration; 2.0 and 2.4 intensities for labor migration, and 0.501–0.575 intensity for international migration.

Meanwhile, internal migration in Ukraine has a direct moderate effect on macroeconomic and financial components of economic security and a reverse moderate effect on food and demographic components. Immigration directly and moderately effects food security, beneficially strongly effects energy security, and has a reverse noticeable effect on macroeconomic, financial, and demographic security components. The correlation analysis shows a strong direct relationship between international migration and financial, social, and investment-innovative security of Ukraine and a reverse strong relationship between youth migration and macroeconomic, investment and innovation, as well as demographic components of economic security.

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Received 11.08.2022

Revised 24.09.2022

Accepted 26.09.2022

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ІННОВАТИВНА ЕМПІРИКА КАУЗАЛЬНОСТІ «МІГРАЦІЯ — ЕКОНОМІЧНА БЕЗПЕКА»

Вступ. В умовах поширення динамічних глобалізаційних процесів міграція як природний феномен і екзистенційна ознака розвитку України набула критичних обсягів, що негативно позначається на ресурсному забезпеченні економічного зростання країни.

Проблематика. Міграція (інтелектуальна, освітня, трудова, стаціонарна) поглиблює соціально-демографічні проблеми (депопуляція поселень, зменшення трудового потенціалу, декапіталізація детермінант людського розвитку,

зникнення середнього класу), є загрозою послаблення економічної безпеки через втрату інтелектуально-кадрових, фінансово-інвестиційних, інноваційно-технологічних ресурсів.

Мета. Визначення зв'язку різних видів міграції та економічної безпеки країни, виявлення критичних рівнів і моделювання впливу міграційних процесів на економічну безпеку України.

Матеріали й методи. Критичні обсяги міграційних процесів (внутрішніх, міжнародних, трудових і освітніх), їх характер їхнього впливу на параметри економічної безпеки України розраховано на основі нелінійних економетричних моделей із застосуванням темпорально-просторового підходу.

Результати. Визначено критичні обсяги міграції (50 тис. осіб — освітня еміграція, 120—150 і 218—235 переміщень у розрахунку на 100 тис. населення — внутрішня міграція, 0,501—0,575 — зовнішня міграція), що негативно впливають на всі параметри економічної безпеки країни. Встановлено, що в Україні поточні обсяги міграції перевищують критичні, а це свідчить про низький рівень керованості міграційних процесів і недовикористання потенціалу міграції для розвитку економіки та її безпеки.

Висновки. Структурні зміни міграційних процесів негативно позначаються на стійкості економічної системи, сприяють появі нових і поширенню існуючих загроз безпеці національної економіки.

Ключові слова: міграція, структура міграції, порогові значення, інтенсивність, безпека, загрози, Україна.