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## Modeling of migration security of Ukraine: Scenario approach to optimization of labor and resource potential

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**Purpose.** To substantiate the impact of migration security on the formation and reproduction of Ukraine's labour-resource potential and to develop a scenario-based approach to its optimisation, considering demographic and migration losses.

**Methodology.** The optimisation model of labour-resource potential is based on the integration of econometric analysis, scenario-based, simulation modelling and system dynamics approaches. The methodology is implemented sequentially: development of an information-analytical framework; identification of key influencing factors; elaboration of migration development scenarios; design of adaptive strategies.

**Results.** Achieving the target level of labour-resource potential by 2030 requires a positive migration balance, which necessitates a reorientation of public policy towards stimulating re-emigration and managed immigration. An effective migration security policy is defined as a комплекс of legal, economic, institutional, financial and innovative instruments. Three development scenarios are identified: optimistic (high reintegration), baseline (limited recovery), and pessimistic (demographic depletion). The optimistic scenario assumes large-scale return migration and employment recovery, whereas the pessimistic scenario implies deepening demographic losses and labour market segmentation. The key parameters shaping labour potential trajectories are the level of re-emigration, the intensity of external migration, and the effectiveness of public policy.

**Originality.** A scenario-oriented model for optimising labour-resource potential with consideration of migration risks is developed, along with a methodological approach to assessing the impact of migration security on the country's socio-economic resilience.

**Practical implications.** The results can be applied in the formulation of state migration policy, the development of reintegration and human potential recovery programmes, as well as in strategic labour market planning under conditions of high uncertainty.

**Keywords:** migration security, labour-resource potential, re-emigration, demographic losses, scenario modelling, employment, migration policy, human potential.

### Introduction

The full-scale war of the Russian Federation against Ukraine, instability, demographic shifts and globalization challenges are forming new vectors of migration flows, the scaling of which is a threat to the national and economic security of the country, complex, ambiguous, giving rise to both risks of loss of resource potential (financial, investment, intellectual, innovative, entrepreneurial, etc.) and challenges for maintaining the stability of the economic system of Ukraine. The aggravation of the migration crisis and ineffective management of migration flows leads to the loss of labor, the formation of a 'personnel shortage' in all sectors of the economy, the depopulation of territories, the impossibility of local development due to a critical weakening of intellectual and personnel security, which complicates the processes of economic revival of the country. The lack of a systematic and scientifically grounded approach to the analysis of migration risks and the optimality of migration processes negatively affects the quality, result and potential of implementation of the state migration policy.

Modern geopolitical transformations have led to a radical change in the demographic and migration landscapes of the state, transforming migration security into the rank of key imperatives of national security. The full-scale war has

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become a factor of transformational changes in the economic system of Ukraine, in particular in the functioning of the national labor market, which operates in a state of constant turbulence and uncertainty. The problem of preserving and reproducing the country's labor potential is of relevance. Thus, according to the estimates of the National Bank of Ukraine, the number of the workforce aged 15-70 years at the beginning of the year. 2024 decreased by 25% compared to 2021 (NBU, 2024). The 40% reduction in the workforce in 2023 compared to 2021 is associated with demographic losses, temporary occupation of part of the territories of Ukraine, as well as an increase in the number of economically inactive population. Large-scale forced displacements of the population have caused significant socio-humanitarian, economic and demographic imbalances, actualizing the need to develop effective mechanisms for managing migration processes. The preservation and rational use of Ukraine's labor and resource potential, which is a determining factor for the post-war recovery of the country, is becoming a priority.

Traditional approaches to strengthening migration security, focused mainly on responding to current events, are insufficient in conditions of high uncertainty and dynamism of the external environment. Therefore, there is an objective need to use proactive methods of analysis and forecasting, in particular scenario design, which allows to systematically assess the potential trajectories of migration processes and their impact on the structure and volume of the country's labor potential. This approach ensures the formation of adaptive strategies and tools of public administration aimed at minimizing the risks associated with irreversible demographic losses and maximizing opportunities for optimizing labor resources in the context of post-shock recovery.

### **Literature review**

The perspective of migration and economic security in research has become one of the key ones in the scientific debates of the last three decades. On the scientific front, migration has been considered as a socio-economic phenomenon, but in the modern context it has become important within the framework of global economic, political and security discussions (Sitek, 2011; Mulska, 2022). International migration has gone beyond the traditional humanitarian, economic, labor and social aspects, becoming a source of complex interactive security challenges for both donor countries, recipients of human resources, and social movements or diasporas.

Increased attention to the problem of migration as a determinant of security is closely related to the structural and dynamic characteristics of migration processes in the XXI century. For example, according to UN estimates, in 1990 about 150 million people lived outside their countries of origin, which was 2 % of the total world population (Klaus & Pachocka, 2019; Lohrmann, 2000]. And in 2020, the total number of international migrants has already reached 280.6 million people, in particular, the number of forcibly displaced persons due to military conflicts and other crisis situations has doubled since 2010. The existential determinants of scaling up migration processes in the world are climate change, demographic boom in some countries with a low level of economic development, wars and pandemics. Security has become central aspects of political and economic narratives about migration in countries with a high level of development.

Migration processes have a significant impact on the national security system, which is manifested in: (1) the formation of national priorities in the field of security of the recipient countries of human resources and transit states, due to the perception of migration as a potential threat to stability, social cohesion, national identity, etc.; (2) complication of bilateral relations between states, which negatively affects the stability of the socio-economic systems of countries; (3) the emergence of new «participants» in migration processes (e.g. refugees) whose security is weakened and not ensured as a result of forced displacements.

In the 1990s, academic discussions were actively conducted to study the nature of the migration factor in the projection of the economic security of the state, as well as methods for studying the security aspects of migration processes against the background of globalization (Ticu, 2011; Varnalii, et al., 2022). This phenomenon has become a component of migration studies, including security, environmental, etc. factors, problems of identification of migration flows (Krause, 2017). There is a transformation of security from the state-centric concept (strategic approach), which focuses on the security of the state and the population (Huysmans & Squire, 2009), to the paradigm of migration security of the individual and society (individual-centered approach). It is worth emphasizing that the need for security is one of the main pull-factors (attraction) that motivates the population to migrate to a particular country. Uncertainty factors are recognized as the main push factors (pushing, stimulating emigration).

According to the strategic approach to the relationship between migration and security, the problems of intensification of migration processes are considered in the national security strategies of countries (MMC, 2022; Vallet, 2023). This approach focuses on considering the impact of migration losses and demographic changes on national security (Tesliuk, 2024; Libanova, et al., 2022; Naporchuk, 2024), considering migration from the refugee problem (Guild & Groenendijk, 2023; Kononov, 2024) to the relationship with social cohesion, the labor market, and the economic system (Lupak, et al., 2022; Mulka, et al., 2023). It is noteworthy that the strategic approach not only limits conceptual and methodological aspects (for example, how the securitization of migration leads to social inequality), but also neutralizes the importance of the socio-economic nature and ambiguity of migration, reducing it to strategic interaction between states (Shen, 2023; tefančnk, et al., 2023).

The approach, which is focused on the security of the migrant person, is based on the protection of individual security, focusing on the personality of the migrant, and not on the state as the main subject of security. The personal approach moves away from the traditional understanding of migration and economic security, takes into account the needs and rights of migrants themselves; is of great value in scientific research and practice, especially in the context of refugees and asylum seekers (Arif, 2020; Massey, 2002), as well as trafficking in human beings, in particular women and children, as well as their economic exploitation (Farhana, et al., 2024; Slatten, et al., 2011). It is worth emphasizing that this approach is associated with the human rights paradigm, which was proposed as an alternative to the more traditional security-oriented approach to the problem of forced emigration (Logan, et al., 2009; Mulka, et al., 2023) and illegal immigration (Brochmann & Hammar, 1999; Goldring & Landolt, 2009).

Approaches to understanding migration security (strategic and person-centered) consider migration in the context of two security requirements – (1) focus on national security, (2) protection of human rights. Within the two approaches, migration is perceived either as a threat to security or as a challenge to ensure the safety of the migrant. It is noteworthy that migrants who are considered ‘unwanted’ or ‘illegal’ by the recipient country can be politicized and presented as actors posing a danger to the social stability and economic well-being of the host countries. Instead, refugees are vulnerable groups in need of humanitarian protection.

In the scientific discourse, current research on migration security is not sufficient to understand the complementary relationship between migration and security, in particular in the context of their favorable interaction and impact on the socio-economic development and sustainability of the country. Thus, the strategic approach does not explain the processes of desecuritization, i.e. the inclusion of migration issues in economic policy, which allows solving problems related to migration without the use of anti-crisis measures. Approaches that consider the

relationship between migration and security in the context of strategic research and individual security do not explain the complexity and multidimensionality of this phenomenon. Both approaches, focusing on threats and dangers, do not identify the potential for migration and the positive impact on the socio-economic development of the human resources donor country.

In the twenty-first century, a new concept of ‘flexicuritization’ appears on the scientific front, which explains migration security as the absence of threats to the development of socio-economic systems of donor and recipient countries of human resources. Such a system of interconnection between migration and security acquires a pragmatic, utilitarian, flexible model of desecuritization of migration, i.e. reducing the level of perception of migration exclusively as a threat. According to scientists (Bermejo, 2009; Collinson, 2000; Varnalii, et al., 2022), this approach is an effective and practical solution for countries that are experiencing the negative effects of the migration crisis and challenges to economic recovery.

Migration is a multidimensional socio-economic phenomenon that, under certain conditions, can turn into a source of threats to national security (Demirkol, 2023; Mulcka & Makhoniuk, 2025). In particular, the scale and dynamism of migration flows cause risks to social stability, economic integrity, state sovereignty and national identity both in countries of origin and in countries of destination. Ensuring migration security involves not only protecting the state from potential threats but also guaranteeing the safety of migrants themselves as a vulnerable social group. It is necessary to form institutional mechanisms aimed at minimizing the risks that accompany the processes of movement, adaptation and integration of migrants into the new environment, in particular physical, psychological, economic and cultural risks.

The modern paradigm of migration security considers migration processes not only as potential threats, but also as a source of socio-economic advantages under conditions of effective management (Klaus & Pachocka, 2019; Libanova, et al., 2022; Mulcka, 2022). It moves away from the traditional state-centric focus, in which security was considered exclusively from the point of view of protecting territorial integrity and political stability, and moves to a human-centered approach, in which the security of the migrant, the host community, and the country is considered as interrelated components. This approach allows integrating the economic, social, humanitarian and security aspects of migration, emphasizing its potential as a tool for development, and not just a source of threats; focused on proactive policies that are based on a balance between national security needs, human rights and global mobility.

### **Methodology**

The methodology of scenario design of migration security in the context of optimization of labor and resource potential is built based on a systematic approach (Table 1), which allows predicting the development of migration processes under the influence of socio-economic factors, assessing their impact on human capital and developing adaptive management decisions.

The model of labor and resource potential of Ukraine (formula 1) allows to substantiate scenarios for the development of the labor market, considering the consequences of the migration crisis, for the purpose of strategic planning of the state policy of remigration and reintegration, immigration policy and assessment of labor market needs until 2030.

$$LRP_t = (N_t^{la} + Im_t - Em_t) * EA_t * LL_t, (1)$$

where:  $LRP_t$  is an indicator of the labor and resource potential of the country (territory) in the t period of time;  $N_t^{la}$  – the number of the population of working

age of the territory in t period of time;  $N_t^{la}$   $Im_t$  – the volume of immigration;  $Em_t$  – the volume of emigration of the population of the territory in the t period of time,  $EA_t$  – the level of the economically active population of the territory in the t period of time;  $LL_t$  – the level of employment of the territory in t period of time.

The indicator of the optimal migration balance can be calculated using formula 2:

$$OpM_t = \frac{LRP_t^{tag}}{EA_t * LL_t} - N_t^{la}, (2)$$

where  $OpM_t$  is the optimal value of the migration balance in t period;  $N_t^{la}$  – the targeted (target) value  $LRP_t^{tag}$  of the labor and resource potential of the territory in t period.

### Purpose of the Study

The purpose of the article is to substantiate the impact of migration security on the formation and reproduction of Ukraine's labor-resource potential and to develop a scenario-based approach to its optimization, considering demographic and migration losses.

To achieve this goal, the following tasks have been identified: to identify the key factors that determine the level of migration security and its relationship with the labor and resource potential; to develop scenarios for the development of the migration situation, taking into account different trajectories of socio-economic dynamics; to build a model for assessing and optimizing labor and resource potential, taking into account migration losses; to substantiate the directions of state policy on reintegration, regulation of migration flows and increasing the efficiency of the use of labor resources in the context of post-crisis recovery.

### Results and Discussion

Despite the difficult situation, starting from 2024, there are signs of a gradual recovery in economic activity, accompanied by a revival in the labor market, in particular an increase in the number of vacancies. According to the largest online employment platform Work.ua, during the first half of 2024, the number of announced vacancies increased by almost 19 thousand, and in June it amounted to more than 110 thousand units. In June 2024, the number of updated or newly created resumes was 304 thousand, which is 47 thousand less than in January 2024 (Slatten, 2011). It is noteworthy that this figure is lower than the corresponding indicators of 2022-2023. A significant decrease in the activity of the population in the process of finding a job is due to both structural factors and motivational barriers associated with the uncertainty of the socio-economic environment, as well as the danger of being in territories that are subject to missile strikes or close to the war zone.

In the context of a relative increase in demand for labor and a decrease in its supply, the level of competition in the labor market decreases. Thus, in June 2024, the competition rate for vacancies reached its minimum level for 2021-2024, which made it difficult for employers to find suitable employees. A study conducted by the European Business Association shows that in 2023, 74% of employers faced a shortage of personnel, 17% noted a partial shortage of employees, and only 7% of companies did not experience difficulties in staffing (Slatten, 2011; EBA, 2024). This situation is the result of the cumulative impact of factors such as large-scale external migration, mobilization of the able-bodied population into the ranks of the Armed Forces of Ukraine, increasing interregional disparities in access to jobs, professional mismatch between supply and demand, as well as exacerbation of sectoral imbalances. In the current conditions, the existing disparities in the labor market are deepening, which makes it impossible to effectively meet the needs of employers in qualified employees.

Taking into account the high level of uncertainty in the field of migration processes, as well as the dependence of demographic dynamics and economic development of Ukraine on domestic and foreign policy factors, it is advisable to carry out scenario modeling of potential challenges and opportunities in the system of optimization of labor and resource potential of Ukraine (the parameters of the scenarios are presented in Table 2): (1) scenario of high reintegration (optimistic); (2) adaptation or limited recovery scenarios (basic); (3) a scenario of demographic exhaustion (pessimistic).

**Table 2**  
**Parameters of scenarios for optimizing the labor and resource potential of Ukraine in the context of the migration crisis, 2025-2030**

Indicators	Scenarios		
	‘High reintegration’	‘Limited recovery’	‘Demographic exhaustion’
Share of labor re-emigration, %	40	20	–
Share of IDP returns, %	60	30	Partial/ undefined
Projected volumes of external emigration, %	2-3	10-12	+1 million people
State reintegration programs	Active, systemic	Limited, point	Absent
Fertility rate, child per woman	1,50	0,90	0,71
Involvement of internal labor resources, level	High	Moderate	Low

*Source: systematized by the author.*

The scenario of ‘*high reintegration*’ provides for the active return of labor emigrants and IDPs because of stabilization of the security situation, the implementation of effective state reintegration programs and stimulation of economic activity at the regional level. The expected volume of re-emigration is 40% of the total number of external migrants and 60% of IDPs. Mobilization of the domestic labor force will be carried out through the launch of national retraining programs, assistance self-employment and entrepreneurship. The role of state policy in the field of human development will grow through the integration of the labor market and the institutionalization of the processes of socio-economic adaptation of returnees.

The ‘*adaptation/limited recovery*’ scenario reflects a moderate development scenario with a partial restoration of the pre-war employment rate, without significant breakthroughs in the field of demographic policy or reintegration of labor migrants. The expected volume of re-emigration is about 20% of emigrants and 30% of IDPs, mostly to large cities and regional centers. Economic growth will be moderate, without a significant impact on changes in migration trends or activation of the domestic labor market.

The scenario of ‘*demographic exhaustion*’ envisages a further deepening of migration risks and the loss of a significant part of the labor potential because of external and internal shocks, without proper intervention by the state. External labor migration is projected at the level of 1 million people over a five-year period. A significant part of IDPs integrate in host countries or in other regions of Ukraine without returning to their places of permanent residence for the return, adaptation and reintegration of migrants will increase the fragmentation of the labor market and demographic depopulation.

Scenario modeling of the development of labor and migration processes and forecasting the effectiveness of measures for the reintegration of labor potential in the conditions of crisis and reconstruction requires the formation of an information

and analytical basis (Table 3). Thus, the level of economic activity of the population aged 15-70 decreased from 63.4% in 2019 to the projected 58.5% in 2024, which indicates a narrowing of the labor segment in the labor potential of Ukraine and an increase in the burden on the social sphere. The employment rate decreased from 58.2% in 2019 to 51.5% in 2024, due to both structural transformations of the labor market and the physical loss of some jobs. The unemployment rate, on the contrary, shows growth, reaching peak values in 2023 (12.0%) with a slight stabilization in 2024 (11.7%). The volume of emigration, according to expert estimates, increased from 5.5 million people in 2019 to 8.0 million people in 2024.

**Table 3**

**Information and analytical base of scenario modeling of labor resource potential of Ukraine, 2019-2024**

Indicators	Years				
	2019	2020	2021	2023*	2024*
Current population (as of January 1), million people	42,03	41,75	41,38	39,0	38,2
The level of economic activity of the population aged 15-70 years, % of the total population of 15-70 years	63,4	62,1	61,8	59,0	58,5
Employment rate of the population aged 15-70 years, %	58,2	56,2	55,7	52,0	51,5
Unemployment rate (according to the ILO methodology), %	8,2	9,5	9,9	12,0	11,7
Emigration volumes, million people	5,5	5,7	5,9	7,8	8,0

Note: \* expert assessments.

Source: based on data from the State Statistics Service.

Forecast scenarios for 2025-2030 demonstrate different trajectories for the development of the labor and resource potential of Ukraine. The optimistic scenario is based on an active state policy to stimulate reintegration and economic growth, which ensures a gradual recovery of the working population and an increase in GDP. The baseline scenario assumes stable but limited development with certain demographic risks. The pessimistic scenario illustrates possible negative trends that require the implementation of measures to prevent a significant deterioration of the socio-economic situation (Table 4). All scenarios demonstrate a gradual decline in the total population, which is due to both negative natural growth and migration processes. The optimistic scenario assumes the least migration and economic losses, while the pessimistic scenario identifies demographic development with a greater intensity of emigration processes and the absence of effective reintegration measures.

The optimistic scenario assumes support or a slight increase in the employment rate due to government programs for the development of the labor market and reintegration. In the baseline scenario, activity stabilizes at an average level, while in the pessimistic scenario, it gradually decreases due to demotivation and a significant imbalance in local labor markets. It is noteworthy that the forecast indicates an improvement in employment in the optimistic scenario, a moderate level in the baseline scenario and a significant decline in the pessimistic scenario, which may be caused by both structural changes in the economy and an increase in the unemployment rate. The optimistic scenario assumes a gradual increase in incomes of the population, which is associated with an increase in labor productivity and an improvement in the economic situation. In the baseline and pessimistic scenarios, the growth of the average level of wages is limited or absent.

To ensure the restoration of economic growth and the stable functioning of the labor market, the target indicator of the labor resource potential of Ukraine for 2030 has been determined – 16 million people (5% more than in 2021). The basic parameters of the simulation model are the indicators of 2021, including the number of the working-age population excluding the migration balance (27.8 million people), the employment rate (55.8%).

Increasing the labor resource potential of Ukraine to 16 million people by 2030, provided that the current level of economic activity and employment is maintained, will require ensuring a net migration increase of about 1.66 million people (Table 5). Such dynamics implies a significant increase in the influx of immigrants, sufficient to compensate for the existing high volumes of emigration.

Ensuring migration security is an important component of the strategy for optimizing the labor and resource potential of Ukraine, since the stability and balance of migration flows directly affect the quality and quantity of available labor. Mechanisms for ensuring migration security should be comprehensive and multi-level, combining legal, economic, social and administrative regulation. Firstly, it is the creation of an effective legislative framework that regulates migration processes, in particular, mechanisms for legalization of labor migrants, protection of their rights, as well as control over compliance with legislation on the prevention of illegal migration. The introduction of modern information systems for monitoring migration flows will allow you to quickly analyze changes in the structure of migration and predict their impact on the labor market. An existential measure is the development and implementation of state programs for the reintegration of IDPs and the return of labor migrants, which provide social, professional and psychological support. Such programs should stimulate the return of the able-bodied population and promote their full integration into local economies.

Secondly, it is necessary to provide active support for the development of regional labor markets through the creation of conditions for attracting migrants, as well as support for the local population in employment. This includes investments in infrastructure, vocational training and retraining, and the development of SMEs. It is noteworthy that the existential mechanism for ensuring migration security is coordination between various authorities, business and the public sector for effective management of migration flows and ensuring their social adaptation. The development of interagency strategies and operational plans will allow for a coordinated response to challenges and threats to the economic system of Ukraine.

The financial mechanism for ensuring migration security in the system of optimization of the labor and resource potential of Ukraine consists in the targeted formation and distribution of budget funds, as well as in attracting additional financial resources to support comprehensive measures aimed at regulating migration processes. Such measures include state programs for social adaptation, reintegration of IDPs and labor migrants, vocational training and retraining, creation of favorable conditions for their employment. Effective financing of these programs ensures the sustainability of migration policies and contributes to a balanced labor market. An important aspect of the financial mechanism is the attraction of international technical and financial assistance, as well as the development of public-private partnership, which allows to significantly expand the resource base and increase the efficiency of the implementation of measures.

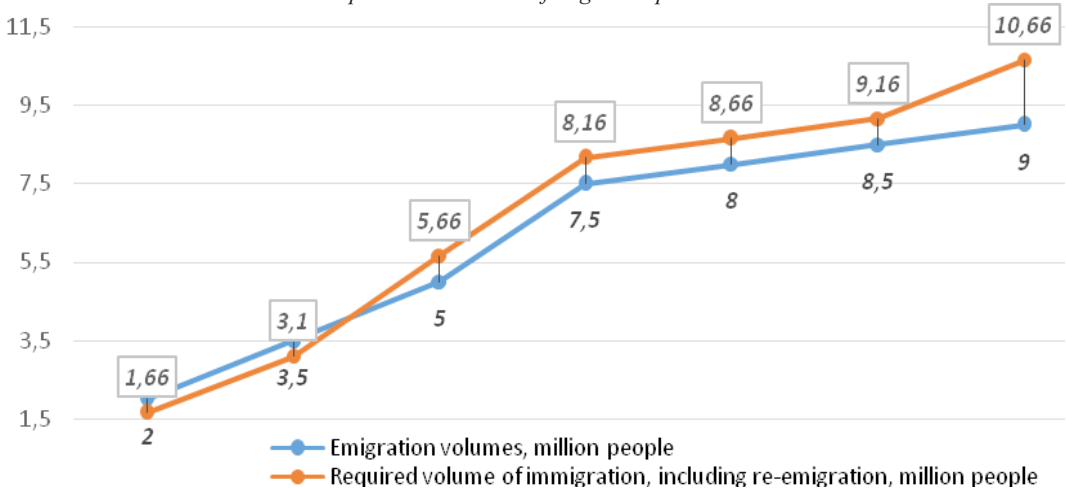
The innovative mechanism, in turn, provides for the introduction of modern information and analytical systems for monitoring and forecasting migration flows, the use of digital platforms for human resources management and automation of migrant adaptation processes. The development of innovative technologies allows to increase the efficiency and accuracy of analytical data for making informed management decisions in the field of migration security. The introduction of innovations contributes to the formation of a mobile, skilled and competitive labor potential that meets the modern requirements of the national and local labor markets. Thus, the synergy of financial and innovation mechanisms creates a comprehensive platform for ensuring effective management of migration processes and optimization of Ukraine's labor and resource potential, contributing to stable economic development and strengthening national security.

**Table 4**  
**Trajectories of development of labor and resource potential of Ukraine: scenario modeling, 2025-2030**

Years	Script	Population, million people	Level of economically active population, %	Employment rate, %	Employed population, million people	Unemployment rate, %	Average salary, thousand tons UAH	Emigration volumes, million people	Volumes of migration substitution, million people
2025	Optimistic	38.0	59.5	54	20.6	7.3	13.5	5.0	+0.5
	Basic	37.0	58.0	51	17.8	9.0	12.0	5.5	+0.2
	Pessimistic	35.0	56.0	47	14.7	15.0	10.5	6.0	-0.3
2026	Optimistic	37.8	59.7	54.5	20.9	7.0	14.5	4.9	+0.6
	Basic	36.6	58.2	50.8	17.7	9.2	12.3	5.5	+0.3
	Pessimistic	34.8	55.5	46.5	14.4	15.0	10.4	6.0	-0.4
2027	Optimistic	37.6	59.9	55.0	21.0	6.8	15.2	4.7	+0.7
	Basic	36.3	58.4	50.5	17.6	9.3	12.5	5.4	+0.3
	Pessimistic	34.6	55.0	46.0	14.0	15.5	10.3	6.2	-0.4
2028	Optimistic	37.3	60.0	55.5	21.3	6.5	15.8	4.5	+0.8
	Basic	36.0	58.5	50.2	17.5	9.4	12.7	5.3	+0.3
	Pessimistic	34.3	54.5	45.5	13.8	16.0	10.1	6.3	-0.5
2029	Optimistic	37.1	60.2	55.7	21.4	6.2	16.2	4.4	+0.9
	Basic	35.7	58.6	50.0	17.5	9.5	12.9	5.2	+0.3
	Pessimistic	34.0	54.0	45.0	13.5	16.5	10.0	6.5	-0.5
2030	Optimistic	37.0	60.0	55.0	21.3	7.0	16.0	4.8	+0.8
	Basic	35.0	58.0	50.0	17.5	9.0	13.0	6.0	+0.2
	Pessimistic	32.0	55.0	45.0	14.4	15.0	10.0	8.5	-0.5

Source: built based on the author's calculations.

*Optimal boundaries of migration processes*



Source: built based on the author's calculations.

## **Conclusions and Directions for Further Research**

The existential role of migration processes as a key factor in the transformation of the labor and resource potential of Ukraine in the context of war and post-crisis shocks has been substantiated. It has been established that the modern dynamics of the labor market is characterized by a stable asymmetry between the supply and demand of labor, which is formed under the influence of large-scale migration losses, demographic reduction and structural imbalances of employment. Scenario modeling has confirmed that the trajectories of development of labor potential are highly sensitive to the parameters of re-emigration, the intensity of external migration and the effectiveness of the state reintegration policy. The optimistic scenario, which provides for an active return of the population and stimulation of economic activity, provides relative stabilization of the labor market and forms the prerequisites for the restoration of economic growth. At the same time, the baseline scenario captures the inertial nature of development with limited reproduction of labor resources, while the pessimistic scenario demonstrates the risks of deepening demographic exhaustion and fragmentation of the labor market.

The proposed model for assessing the labor and resource potential allows formalizing the impact of migration flows on the volume of labor force through the integration of demographic, migration and economic parameters. The obtained calculations show that achieving the target level of labor potential requires a significant positive migration balance, which objectively transforms the emphasis of state policy towards stimulating re-emigration and managed immigration. It has been proved that effective optimization of labor and resource potential is impossible without the formation of a comprehensive system for ensuring migration security, which combines legal, economic, institutional and innovative tools. Of particular importance is the development of mechanisms for monitoring and forecasting migration processes, the integration of employment policy with migration policy, as well as the regionalization of managerial decisions, considering the spatial differentiation of the labor market.

The scenario approach is an effective analytical tool to support strategic planning, allowing to identify critical limits of human capital losses, assess alternative development trajectories, and form adaptive mechanisms of state regulation in conditions of high uncertainty.

Further research should focus on complementary design of the impact of migration on the labor market and regional development using methods of macro- and micro-level simulation modeling (temporal, spatial-econometric, agent-oriented approaches); empirical testing of the effectiveness of reintegration and employment policies based on quasi-experimental approaches, as well as the introduction of digital tools for monitoring migration flows.

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**Мульська О. П. Моделювання міграційної безпеки України: сценарний підхід до оптимізації трудових ресурсів та потенціалу**

**Мета.** Обґрунтувати вплив міграційної безпеки на формування та відтворення трудових ресурсів та потенціалу України та розробити сценарний підхід до його оптимізації, зважаючи на демографічні та міграційні втрати.

**Методологія.** Оптимізаційна модель трудових ресурсів та потенціалу базується на інтеграції економічного аналізу, сценарного, імітаційного моделювання та підходів системної динаміки. Методика реалізується послідовно: формування інформаційно-аналітичної бази, ідентифікація ключових факторів впливу, розроблення сценаріїв розвитку міграційної ситуації та формування адаптивних стратегій.

**Результати.** Досягнення цільового рівня трудових ресурсів та потенціалу до 2030 р. потребує формування позитивного міграційного сальдо, що зумовлює переорієнтацію державної політики на стимулювання рееміграції та керованої імміграції. Ефективна політика міграційної безпеки визначається як комплекс правових, економічних, інституційних, фінансових та інноваційних інструментів. Виокремлено три сценарії розвитку: оптимістичний (висока реінтеграція), базовий (обмежене відновлення) та песимістичний (демографічне виснаження). Оптимістичний сценарій передбачає масоване повернення мігрантів і відновлення зайнятості, песимістичний – поглиблення демографічних втрат і сегментацію ринку праці. Визначальними параметрами, що формують траєкторії розвитку трудового потенціалу, є рівень рееміграції, інтенсивність зовнішньої міграції та результативність державної політики.

**Оригінальність.** Розроблено сценарно-орієнтовану модель оптимізації трудових ресурсів та потенціалу, зважаючи на міграційні ризики, і запропоновано методичний підхід до оцінювання впливу міграційної безпеки на соціально-економічну стійкість країни.

**Практична цінність.** Результати можуть бути використані у формуванні державної міграційної політики, розробленні програм реінтеграції та відновлення людського потенціалу, а також у стратегічному плануванні розвитку ринку праці в умовах високої невизначеності.

**Ключові слова:** міграційна безпека, трудові ресурси та потенціал, рееміграція, демографічні втрати, сценарне моделювання, зайнятість, міграційна політика, людський потенціал.

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