UDC 331.5:311.1
JEL Classification: C40; O10

INTEGRATION OF WAR VETERANS: SPECIFICITY OF ECONOMIC AND STATISTICAL ASSESSMENT OF THE COUNTRY'S HUMAN CAPITAL RESTORATION

©2026 **SIEROVA I. A., BROVKO O. I.**

UDC 331.5:311.1
JEL Classification: C40; O10

Sierova I. A., Brovko O. I.

Integration of War Veterans: Specificity of Economic And Statistical Assessment of The Country's Human Capital Restoration

Large-scale military aggression has led to an unprecedented shortage of personnel in the Ukrainian labor market, exhausting extensive labor resources. A destructive gap arises when the real sector of the economy experiences a severe personnel shortage, while the unemployment rate among demobilized veterans exceeds 30%. Existing statistical systems assess only individual, fragmentary indicators, creating an urgent need to develop a comprehensive economic and statistical methodology to overcome this barrier and restore national human capital. The purpose of the study is to develop a general scheme for the economic and statistical assessment and modeling of processes of veteran integration as a strategic component of the country's human capital, based on the synchronization of state policy and infrastructure factors. The research methodology is based on a combination of macroeconomic analysis methods, economic and mathematical modeling, multivariate linear regression, visual analysis methods, and comprehensive statistical monitoring, using a mixed quantitative and qualitative approach. As a result of the study, it is substantiated that the modern challenges of post-war development require a transition from fragmentary measurement of individual social indicators to a comprehensive system of statistical assessment, which can ensure the effectiveness of the state policy of veterans' integration and their contribution to the formation of human capital as a component of economic growth. The international experience in organizing veterans' reintegration programs is summarized, and the key areas for their economic and statistical monitoring are identified. The feasibility of a mixed approach to assessment, integrating quantitative indicators with qualitative aspects of social adaptation, psychological well-being, and public activity, has been proven. A general scheme for the economic and statistical assessment of the transformation of veteran resources into restored human capital is proposed, in which statistical monitoring serves as an integrated information and analytical subsystem that accompanies all stages of the process, from assessing human capital losses to measuring the results of its restoration. A multifactor regression model was constructed, confirming the statistically significant impact of financing adaptation programs, the development of a network of veteran centers, and wage levels on the scale of veteran employment. An assessment of the potential growth in gross domestic product from reduced unemployment among veterans was conducted, enabling us to quantify the economic impact of their successful integration. The practical significance of the results lies in establishing a methodological basis for a system of evidence-based public administration, improving statistical monitoring, and developing an effective policy for the post-war restoration of Ukraine's human capital.

Keywords: *integration of war veterans; reintegration; human capital; economic and statistical analysis; quantitative and qualitative assessment; monitoring, modeling.*

DOI: *https://doi.org/10.32983/2222-0712-2026-2-402-413*

Fig.: *3.* ***Tabl.:*** *8.* ***Formulae:*** *2.* ***Bibl.:*** *31.*

Sierova Iryna A. *– Candidate of Sciences (Economics), Associate Professor, Associate Professor of the Department of Statistics and Economic Forecasting, Simon Kuznets Kharkiv National University of Economics (9a Nauky Ave., Kharkiv, 61165, Ukraine)*

E-mail: *irina.cevaro@gmail.com*

ORCID: *http://orcid.org/0000-0001-7178-9609*

Brovko Olha I. *– Candidate of Sciences (Economics), Associate Professor, Associate Professor of the Department of Statistics and Economic Forecasting, Simon Kuznets Kharkiv National University of Economics (9a Nauky Ave., Kharkiv, 61165, Ukraine)*

E-mail: *ol.iv.brovko@gmail.com*

ORCID: *https://orcid.org/0000-0003-0136-9355*

УДК 331.5:311.1
JEL Classification: C40; O10

Сєрова І. А., Бровко О. І. Інтеграція ветеранів війни: специфіка економіко-статистичної оцінки відновлення людського капіталу країни

Масштабна військова агресія зумовила безпрецедентний дефіцит кадрів на українському ринку праці, вичерпавши екстенсивні джерела залучення трудових ресурсів. Виникає деструктивний розрив, коли реальний сектор економіки відчуває жорсткий кадровий голод, тоді як рівень безробіття серед демобілізованих ветеранів перевищує 30 %. Наявні статистичні системи оцінюють лише окремі фрагментарні показники, що зумовлює гостру потребу в розробці комплексної економіко-статистичної методології для подолання цього бар'єра та відновлення національного людського капіталу. Метою дослідження є розробка загальної схеми економіко-статистичної оцінки та моделювання процесів інтеграції ветеранів як стратегічного компонента людського капіталу країни на основі синхронізації державної політики та інфраструктурних чинників. Методологія дослідження базується на поєднанні методів макроекономічного аналізу, економіко-математичного моделювання шляхом побудови багатофакторної лінійної регресії, методів візуального аналізу та комплексного статистичного моніторингу із застосуванням змішаного кількісного та якісного підходу. У результаті дослідження обґрунтовано, що сучасні виклики післявоєнного розвитку потребують переходу від фрагментарного вимірювання окремих соціальних показників до комплексної системи статистичного оцінювання, яка здатна забезпечити результативність державної

політики інтеграції ветеранів та їх внесок у формування людського капіталу, як складової економічного зростання. Узагальнено міжнародний досвід організації програм реінтеграції ветеранів та визначено ключові напрями їх економіко-статистичного моніторингу. Доведено доцільність використання змішаного підходу до оцінювання, який інтегрує кількісні статистичні індикатори з якісними характеристиками соціальної адаптації, психологічного благополуччя та громадської активності. Запропоновано загальну схему економіко-статистичної оцінки трансформації ветеранського ресурсу у відновлений людський капітал, у якій статистичний моніторинг виступає інтегрованою інформаційно-аналітичною підсистемою, що супроводжує всі етапи процесу – від оцінювання втрат людського капіталу до вимірювання результатів його відновлення. Побудовано багатофакторну регресійну модель, що підтвердила статистично значущий вплив фінансування програм адаптації, розвитку мережі ветеранських центрів та рівня оплати праці на масштаби працевлаштування ветеранів. Здійснено оцінку потенційного приросту валового внутрішнього продукту внаслідок скорочення безробіття серед ветеранів, що дозволило кількісно визначити економічний ефект їх успішної інтеграції. Практичне значення отриманих результатів полягає у формуванні методичного підґрунтя для побудови системи доказового державного управління, удосконалення статистичного моніторингу та розробці ефективної політики післявоєнного відновлення людського капіталу України.

Ключові слова: *інтеграція ветеранів війни; реінтеграція; людський капітал; економіко-статистичний аналіз; кількісна та якісна оцінка; моніторинг, моделювання.*

Рис.: *3.* ***Табл.:*** *8.* ***Формул:*** *2.* ***Бібл.:*** *31.*

Сєрова Ірина Анатоліївна *– кандидат економічних наук, доцент, доцент кафедри статистики і економічного прогнозування, Харківський національний економічний університет імені Семена Кузнеця (просп. Науки, 9а, Харків, 61165, Україна)*

E-mail: *irina.cevaro@gmail.com*

ORCID: *http://orcid.org/0000-0001-7178-9609*

Бровко Ольга Іванівна *– кандидат економічних наук, доцент, доцент кафедри статистики і економічного прогнозування, Харківський національний економічний університет імені Семена Кузнеця (просп. Науки, 9а, Харків, 61165, Україна)*

E-mail: *ol.iv.brovko@gmail.com*

ORCID: *https://orcid.org/0000-0003-0136-9355*

Introduction. The current stage of development of Ukraine's national economy is characterized by deep tectonic shifts in its demographic, social, and institutional architecture. Large-scale military aggression has caused unprecedented pressure on the labor market, provoking the most acute crisis in the modern history of reproduction and preservation of human potential. The destruction of production facilities, large-scale migration waves that have taken millions of working-age citizens out of the country, and direct demographic losses have created a critical shortage of personnel. This shortage today is the main limiting factor for restoring macroeconomic stability. Under such conditions, traditional extensive sources of attracting labor resources are exhausted.

In this context, the search for internal, dynamic, and strategically important reserves to restore the country's human capital becomes particularly relevant. In the system of national accounts [19] (SNA 2025) and in approaches to determining the level of sustainable development [23], human capital is interpreted as a set of skills, health, experience, and social potential that shape the economy's productivity. A specific profile of human capital is made up of war veterans, who, on the one hand, have a high level of discipline, leadership competencies, technical skills, and are stress-resistant, but at the same time, may have barriers due to psychological and physical trauma, loss of social ties, and inconsistency of military experience with civilian qualification requirements. Therefore, the integration of veterans is not only a component of social policy but also an investment in restoring the economy's productivity and sustainability.

A specific challenge in assessing veterans' integration is the need to simultaneously account for the individual and social levels of human capital restoration. If the individual level involves the restoration of professional competencies, physical and mental health, economic independence and professional mobility, then the social level assesses the contribution of veterans to the formation of the country's labor potential, the development of entrepreneurship, innovative activity, labor productivity, social cohesion and economic restoration. The evidentiary basis for assessing the integration of war veterans and determining their contribution to the restoration of human capital is statistical. However, existing statistical systems mainly assess individual aspects of this process, such as the level of employment, income, social security, and the available statistical indicators record systemic institutional barriers to their return to civilian employment, which does not allow for a comprehensive measurement of the contribution of veterans to the restoration of the country's human capital.

A paradoxical, destructive situation arises: the real sector of the economy is experiencing a severe personnel shortage. At the same time, a significant part of the most motivated and able-bodied population remains economically inactive or faces chronic unemployment.

Identifying a general algorithm of actions to overcome this gap through economic and statistical modeling and the optimization of the reintegration infrastructure is a practical task, the successful solution of which will determine the level and pace of restoration of the country's national human capital.

Analysis of research and publications. The foundations of the conceptualization of human capital as a leading factor in economic growth were laid by representatives of the Chicago School of Economics, in particular Nobel laureates Theodore Schultz [17] and Gary Becker [4]. In their classic works, they argued that spending on education, health care, advanced training, and labor mobility is not consumer spending, but a form of capital investment that generates significant macroeconomic effects in the future through increased labor productivity.

In domestic scientific literature [1; 3; 5; 10; 12; 18; 26; 29; 30], the transformation of human capital in conditions of

crises and martial law is actively studied by leading scientists of the Institute of Demographic and Social Policy of the National Academy of Sciences of Ukraine, experts of the Razumkov Center, as well as scientists Ya. Zhalilo, O. Pelyukh, A. Babichev. The features of the modern labor market, barriers to employment, and trends in veteran business are analyzed in reports by the Ukrainian Veterans Fund and the National Institute for Strategic Studies.

The main focus of modern research on the veteran community has shifted to social protection, psychological rehabilitation, and compensation payments. In scientific discourse, a veteran is mainly positioned as a "recipient of benefits", which is a passive form of interaction between the state and the citizen. Instead, the assessment of a veteran as an "active subject of the labor market" and a "strategic investor in one's own human capital" remains out of focus. The task of quantifying the losses of macroeconomic output due to the ineffective participation of demobilized service members remains unresolved, and there is also no clear econometric analysis of how local infrastructure factors (for example, a network of hubs) and financial injections are translated into real employment indicators. Thus, a comprehensive economic and statistical analysis that combines quantitative mathematical models with an assessment of human capital losses/gains through the prism of veteran resources still requires further development.

The purpose of the article is to develop a general scheme for the economic and statistical assessment of veterans' integration as a component of human capital, grounded in the synchronization of state policy with civil society initiatives and clear performance indicators.

Research methodology. The study used a combination of macroeconomic analysis methods, economic and mathematical modeling methods, visual analysis methods, and a statistical monitoring system to build a comprehensive system for economic and statistical evaluation of the integration process for war veterans and to determine their contribution to the restoration of national human capital.

Methods of macroeconomic analysis. To quantify the macroeconomic losses to the national product resulting from the ineffective integration of demobilized military personnel into civilian employment, the author proposes a modified version of Okun's law. The modified approach enables estimating the volume of lost potential gross domestic product (L_{GDP}) due to the unemployment of a specific population group, i.e., war veterans. The calculation formula has the following form:

$$L_{GDP} = \beta \cdot (U_{\upsilon} - U_n) \cdot \left(\frac{v_{pop}}{E_{total}} \right) \cdot GDP_{real}, \qquad (1)$$

where β – *GDP* sensitivity coefficient to unemployment (for transition economies) β=2);

U_v – current unemployment rate;

U_n – optimal unemployment rate;

V_{pop} – number of veterans of working age;

E_{total} – total number of employed people in the country;

GDP_{real} – expected real GDP.

Methods of economic and mathematical modeling. To identify, mathematically describe, and predict the relationship between the processes of successful integration of veterans and key factors of the macroinfrastructural and financial environment, it is proposed to use a multifactor linear regression model.

$$Y = \beta_0 + \beta_1 \cdot X_1 + \beta_2 \cdot X_2 + ... + \beta_n \cdot X_n + \varepsilon, \qquad (2)$$

where Y – dependent variable;

X_1, X_2, X_n – independent variables;

β_0 – free regression term;

β_1, β_2, β_n– regression coefficients for the relevant factors, which show the strength and direction of each factor's influence on the outcome,

ε– random error of the model, which takes into account the influence of other factors not taken into account in the model.

Visual analysis methods. To ensure high clarity, identify hidden structural relationships, and pre-verify econometric assumptions, the study used a set of visual analysis methods. Data visualization is not only a tool for illustrating results, but also an independent analytical method at the stages of descriptive analysis and model interpretation.

Statistical monitoring. To ensure continuous tracking of the dynamics of integration processes and information content of economic and mathematical models, a comprehensive statistical monitoring scheme has been formed in the study.

Research results. Human capital in the classical sense is a set of knowledge, skills, health, motivation, and energy possessed by individuals and used in the economy to generate income and increase labor productivity. War radically changes this definition, introducing specific destructive and constructive elements [30, 3]. On the one hand, there is a direct destruction of human capital (disability, deterioration of mental health, professional degradation due to prolonged absence from the civilian profession). On the other hand, military experience generates unique, extremely scarce competencies for the modern labor market.

In the world practice, there are several dominant models of veteran reintegration, which institutional architecture, tool sets, and target segments can classify. A summary of approaches in countries with representative experience is given in Table 1.

The indicated areas of assessment of integration processes are structured by types of interventions, which, given the need to simultaneously take into account the individual and social levels of human capital restoration, allow for considering it as a strategic factor of post-war economic development (Table 2).

In Ukraine, the assessment of the integration of war veterans has significant methodological features that distinguish it from standard sociological research, because: it requires a multidimensional approach (taking into account economic, social, and psychological integration), the use of mixed methods (quantitative and qualitative), a stratified sample taking into account the specifics of the veteran population, as well as comparative analysis with control groups of the civilian population.

Modern research on veteran reintegration is based on a four-dimensional conceptual model, where successful integration is defined by the achievement of such outcomes as:

Table 1

Key areas of integration of war veterans for the restoration of human capital

Direction	Country	Feature
Vocational rehabilitation and retraining	USA	combining financial support for education with individual support until stable employment
	Canada	partnering with the private sector for targeted hiring of veterans
	Israel	focus on high-tech sectors and use of alumni networks for quick access to the labor market
Entrepreneurship support	USA	combining financial support with training, mentoring and expert support
	Ukraine	combining financial support with training and mentoring
	Sri Lanka	integrating technical training with access to microcredit
Supported Employment Models	USA	focus on the veteran's "job of choice" rather than any available job
	Canada	integration with psychological rehabilitation and family support
Psychosocial support and mental health	USA	integration of psychological support with employment programs
	Canada	a family-centered approach that increases the effectiveness of social inclusion
	Israel	using the veteran community for emotional and professional support
Institutional and policy instruments	USA	harmonization of standards for access to services, transparency, cooperation with non-governmental organizations
	EU	
	Sri Lanka	Focus on: rehabilitation, reintegration, reconciliation and recovery (the "4R" model) and the possibility of additional consideration of the spiritual and religious component for a multicultural context
Innovative and digital tools	USA	integration of employment, training, and psychological support services
	Ukraine	
	Israel	integration of employment, training, and psychological support services
Employers as key partners	USA	corporate culture that supports veterans
	Ukraine	an increase in the number of companies participating in veteran initiatives
Performance evaluation and monitoring	USA	regular public reporting for transparency
	Canada	calculation of indicators: economic independence, quality of life, access to services
	Ukraine	evaluation of programs based on indicators of employment, entrepreneurial activity, and social inclusion

Source: compiled by the authors based on sources [1; 6; 8; 13; 25]

Table 2

Key models of veteran reintegration

Country	Model	
	gist	Feature
USA	comprehensive federal support system	a decentralized but coordinated ecosystem with a clear distinction between the roles of federal, state, and local institutions
Canada	integrated veteran-family-community approach	emphasis on family support and local communities, which increases the effectiveness of social inclusion
Israel	integrated veteran-family-community approach	use of a network approach (alumni, industrial clusters) and focus on high-tech sectors
EU	harmonization of standards and local initiatives	emphasis on harmonization of standards, transparency and accessibility of services, as well as cooperation with non-governmental organizations
Sri Lanka	4R model: rehabilitation, reintegration, reconciliation, recovery for post-conflict reintegration	a combination of technical training, social cohesion, and cultural and religious sensitivity

Source: compiled by the authors based on sources [1; 20; 24]

- economic integration: employment, entrepreneurship, financial stability;
- mental health: absence of psychological disorders, depression, anxiety;
- positive community relations: social inclusion, acceptance of real opportunities;
- constructive civic participation: civic activity without radicalization.

The relationship between these results can be defined as the influence of favorable factors or barriers in the integration assessment model.

A feature of the methodology for statistical assessment of war veterans' integration is:

- the formation of a representative sample based on a combination of stratified data selection by region, gender, age, and disability status, with the «snowball» method through veteran organizations, rehabilitation centers, veterans' gathering places, and taking into account data weighting in accordance with official statistics;
- the use of a mixed research method that combines quantitative and qualitative approaches in obtaining an effective statistical assessment;
- a system of indicators that accounts for specific challenges in statistical assessment, such as data sensitivity, population heterogeneity, process dynamics, and integration with administrative data.

Focusing on the integration of war veterans into the processes of restoring human capital as a complex socio-economic phenomenon, it is impossible to rely solely on traditional statistical indicators of employment or income. International organizations (OECD, ILO, UNDP, IOM) recommend the use of mixed-methods, which integrate quantitative and qualitative assessment methods, to assess the effectiveness of reintegration programs for veterans and other groups returning to civilian life.

Table 3

Specifics of assessing the integration of war veterans into the restoration of human capital

Characteristics	Rating	
	Quantitative	High quality
Essence	measuring the scale and effectiveness of veterans' integration using a system of statistical indicators.	research into the subjective perception of veterans of their own integration, social adaptation and opportunities for realizing their accumulated human capital
Indicators	employment rate, duration of job search, level of economic activity, income, share of veterans who have undergone vocational training or retraining, share of entrepreneurial initiatives launched, level of labor productivity, availability of medical and psychological rehabilitation, participation in social programs, level of reintegration into the educational environment, and other human capital indicators	assessment of psychological well-being, level of social trust, sense of belonging to the community, job satisfaction, professional self-realization, effectiveness of interaction with state institutions, accessibility of social services, level of discrimination, motivation for professional development and entrepreneurial activity
Feature	the need to analyze indicators in dynamics using administrative registers, sample population surveys and panel studies, which allows assessing the sustainability of integration results.	the need to use: in-depth interviews, focus groups, expert assessments, case studies, sociological surveys and content analysis methods, which allows taking into account the priority of the individual needs of veterans

Source: compiled by the authors based on sources [7; 9: 16; 21; 23]

Therefore, the specificity of assessing the integration of war veterans lies in the combination of objective statistical characteristics with subjective assessments of the quality of life and social adaptation.

The process of transforming and restoring the structure of human capital is shown in Fig. 1.

The proposed scheme demonstrates that an integrated information and analytical subsystem that functions at all stages of the transformation of veteran resources into human capital is statistical monitoring. At each stage, specific statistical sources and indicators are used to collect, integrate, analyze, and disseminate information to support management decisions.

This approach transforms statistics from an accounting tool into a continuous feedback mechanism that ensures evidence-based policy formation, prompt adjustment of veteran integration programs, and quantitative assessment of their contribution to the restoration of human capital in Ukraine.

Effective management of this process requires a shift from the concept of «veteran as a recipient of benefits» to «veteran as a strategic investor of his own human capital in the state economy» [26].

For a detailed analysis of the current situation, key statistical indicators of employment and unemployment among veterans in Ukraine were considered compared to the overall indicators for the country in recent years (Table 4).

The data in Table 4 clearly demonstrate the rapid deepening of disparities. If in 2022 the unemployment rate among veterans was relatively low (due to the initial wave

As shown in Figure 2, the main destructive factors are the lack of relevant professional skills (32%) and psychological difficulties in adaptation (30%). However, a significant share (25%) is occupied by prejudice on the part of enterprise management, which requires immediate institutional intervention and changes in corporate culture. To identify and quantify the

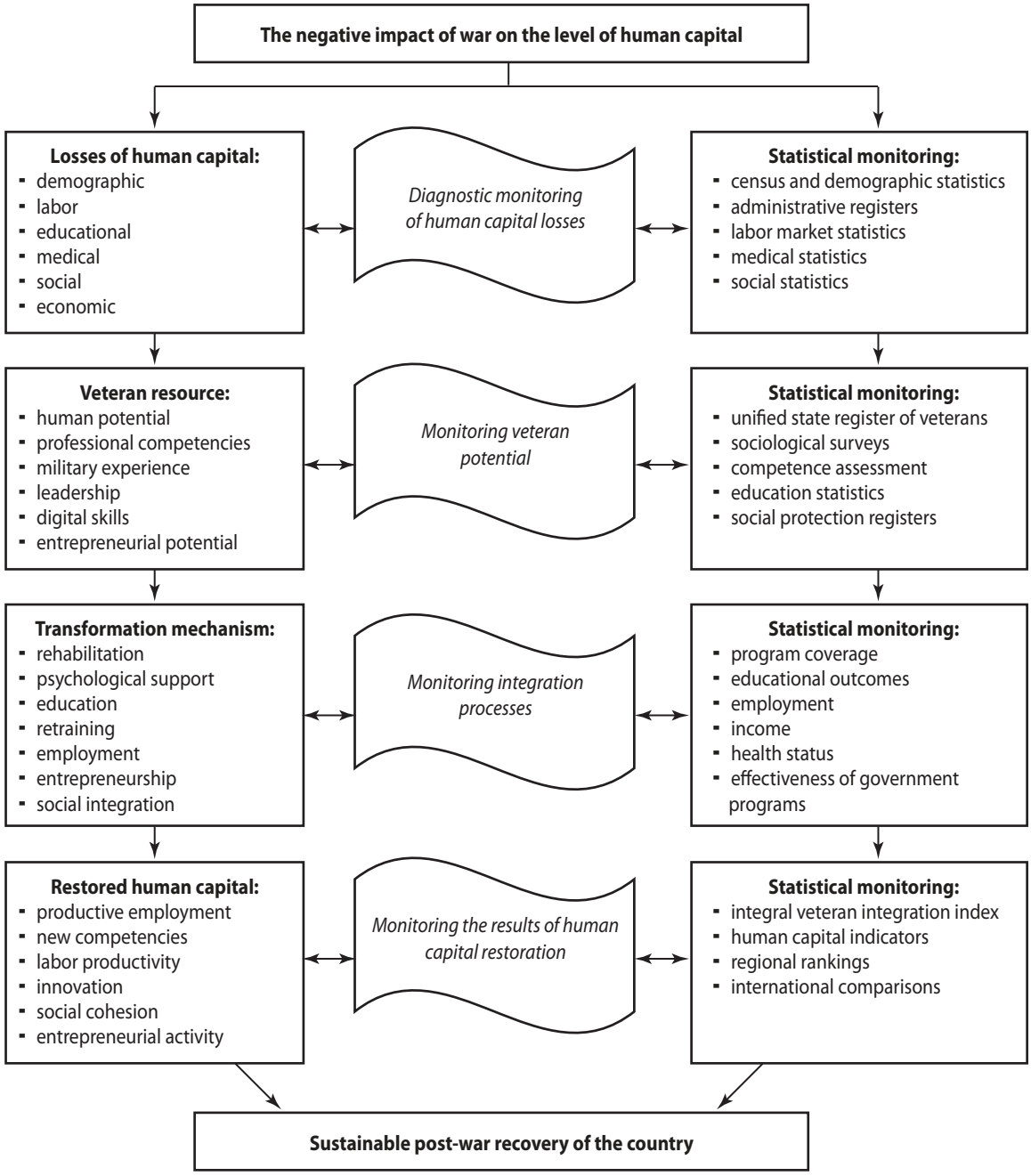

Fig. 1. General scheme of transformation and restoration of human capital of Ukraine through veteran resources

Source: compiled by the authors based on sources [11; 17; 27; 28]

relationship between veterans' successful integration and macroenvironmental factors, we will build a multivariate linear regression model. The selection of influencing factors was based on a comparative analysis of literature sources [1; 2; 3; 4; 12; 15; 17; 22; 26; 29; 30]. The conducted thorough analysis allowed us to make the following assumption: that the dependent variable (Y) in the study is the number of successfully employed (i.e., those who opened their own business) veterans per year (in thousands). Moreover, among the influencing factors, the following indicators were highlighted:

X_1 — the amount of funding for retraining programs and grants for veterans (million UAH);

X_2 — the number of operating hubs and adaptation centers (units);

X_3 — the average wage level of inclusive vacancies (thousand UAH).

Quarterly statistical data from 2022 to the first half of 2026 were used to build the model (Fig. 3).

Analyzing the indicators' dynamics (Fig. 3), we conclude that there is a stable upward trend. From 2022 to the present, the number of employed veterans has increased almost 6.5 times due to the expansion of veteran reintegration programs. Funding for veteran retraining programs is increasing each year, as the development of human resources has become a pri-

Table 4

Dynamics of labor market indicators in Ukraine

Indicator name	Year				
	2022	2023	2024	2025	2026 (calculated values)
Total number of veterans, million people	0.8	1.1	1.3	1.5	1.6
Unemployment rate among veterans, %	10.0	28.0	30.9	31.5	30.8
Unemployment rate in the country, %	21.2	19.5	17.2	15.4	14.2
Average duration of job search by a veteran, months	4.5	6.5	8.0	7.5	7.5
Share of veterans who want to start their own business, %	12.4	15.2	22.1	25.4	27.1

Source: compiled by the authors based on sources [2; 4; 15; 22]

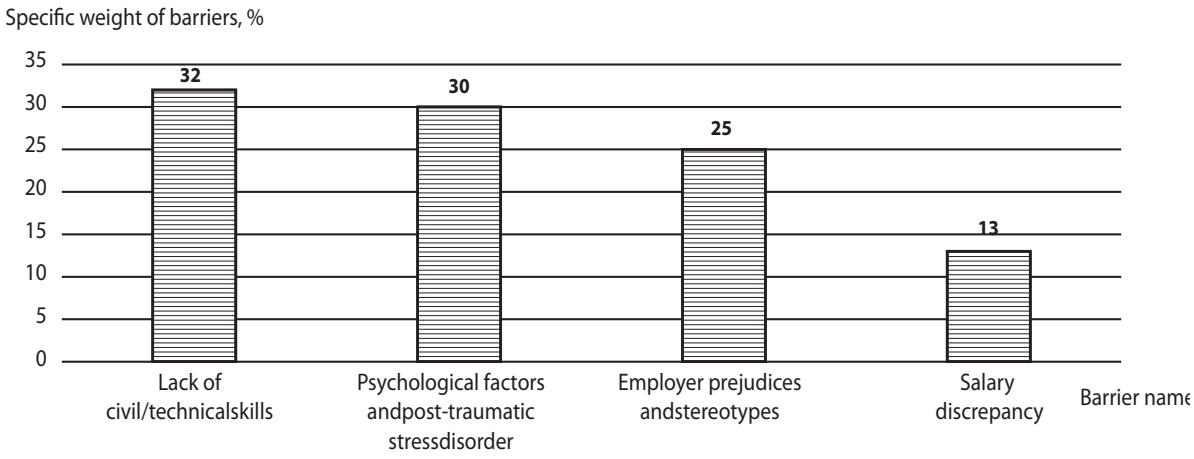

Fig. 2. Distribution of the specific weight of barriers to employment of war veterans

Source: constructed by the authors based on [2]

ority for state budgets and international donors alike. As for the number of hubs/centers and wage levels, these two indicators developed during the studied period in line with labor market demand. The wage level for inclusive vacancies increased from 14.5 thousand UAH to 26 thousand UAH, reflecting the general shortage of personnel in the country's economy and the growing value of veteran potential.

Let us conduct a preliminary analysis of the relationship between the dependent and independent variables in the linear regression model by constructing a matrix of paired coefficients (Table 5) in SPSS.

The values of the coefficients in the pairwise correlation matrix (Table 5) indicate a strong direct linear relationship between U and the selected indicators X_1, X_2, and X_3. The largest value of the pairwise correlation coefficient is observed between the number of employed veterans and the network of development of veteran hubs (centers), with a coefficient of 0.999. Also, a strong relationship (r=0.995) is observed between the number of employed veterans, i.e., integrated into the country's economy, and the amount of financing for veteran adaptation programs.

Despite the high values of the mutual correlation of factors, which is characteristic of macroeconomic time series in conditions of systemic crisis, conducting an additional Variance Inflation Factor test in the SPSS package showed that the values of the indicators are within the permissible critical thresholds [14] for specific socio-economic models of the war period. This confirms the meaningful autonomy of each factor and the absence of multicollinearity among the selected indicators.

Thus, the selected indicators are statistically significant, allowing us to build a multivariate regression model in SPSS, the results of which are presented in Table 6.

Analyzing the significance of the variables using p-values, we can conclude that each indicator included in the model is statistically significant, i.e., its p-value does not exceed the critical value of 0.05. Thus, each indicator has a significant impact on veterans' employment levels, i.e., it affects veterans' integration into the country's economic space.

The obtained coefficients (Table 6) allow us to form a regression equation, which has the following form:

$$Y = 12.45 + 0.084 \cdot X_1 + 1.215 \cdot X_2 + 0.432 \cdot X_3.$$

The model is qualitative, which is confirmed by the indicators given in Table 7.

Thus, the multiple correlation coefficient (R = 0.920) indicates a very close relationship between the factor indicators and the result. The coefficient of determination (R^2 = 0.846) indicates that the constructed model explains 84.6% of the dynamics of veterans' integration into the country's economy.

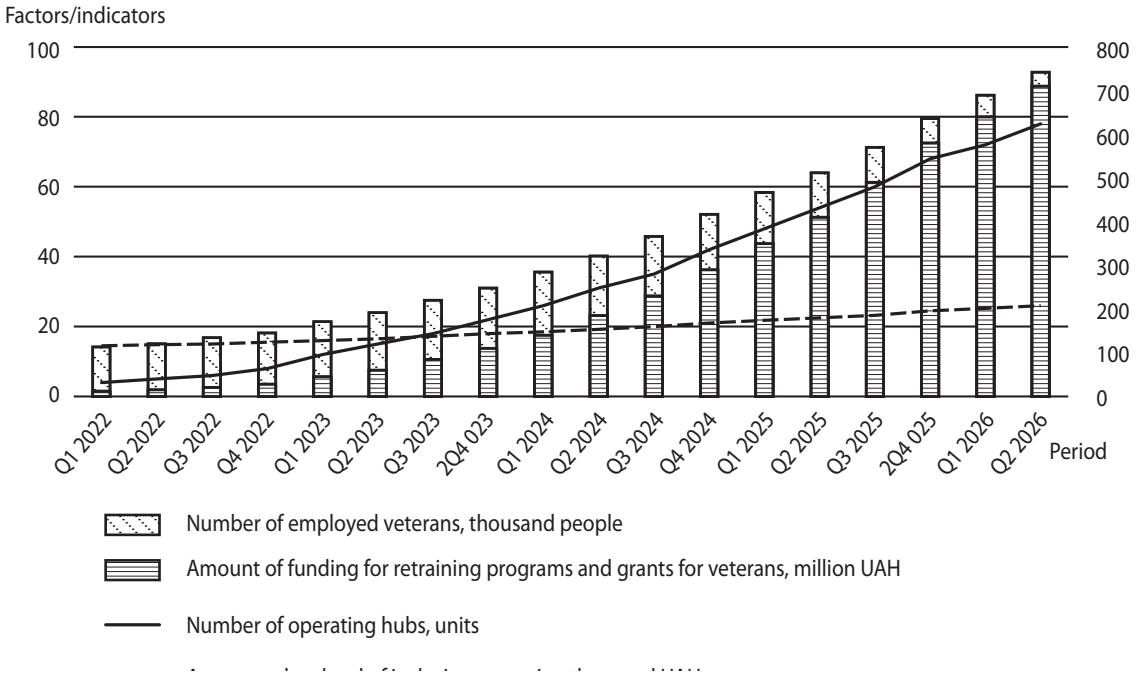

Fig. 3. Dynamics of dependent and independent factors/indicators of a linear multivariate regression model

Source: constructed by the authors based on [2; 4; 15; 22; 26]

Table 5

Matrix of pairwise correlation coefficients

Indicator name	y	X_1	X_2	X_3
y	1.000	0.995	0.999	0.996
X_1	0.995	1.000	0.991	0.983
X_2	0.999	0.991	1.000	0.998
X_3	0.996	0.983	0.998	1.000

Source: authors' own calculations

Table 6

Coefficients of the linear multifactor regression model

Variable	Non-standardized coefficients (b)	Standard error of the coefficient	Standardized odds (Beta)	Student's t-test	Significance of the variable (p-value)
Constant	12.450	3.120		3.99	0.001
X_1	0.084	0.021	0.412	4.00	0.001
X_2	1.215	0.310	0.485	3.92	0.002
X_3	0.432	0.142	0.335	3.04	0.009

Source: authors' own calculations

The value of the Durbin-Watson criterion (1.952) is within the optimal range from 1.5 to 2.5, which proves the absence of autocorrelation of the residuals. To assess the model's reliability and statistical significance, the Fisher criterion was calculated; the results are shown in the Table 8.

Thus, the calculated Fisher criterion (F = 24.84) is significantly greater than the tabular value, and the p-value is < 0.001 (below the classical threshold of 0.05), indicating that the obtained regression model is statistically reliable and suitable for macroeconomic forecasting.

So, based on the results of the constructed regression model, the following conclusions can be drawn:

1) an increase in the amount of funding for veteran adaptation programs (X_1) by 1 million UAH ensures

Table 7

Quality indicators of the constructed linear multivariate regression model

Indicator name	Indicator value
Multiple correlation coefficient (R)	0.920
Coefficient of determination (R^2)	0.846
Adjusted R-squared	0.812
Standard error of estimate	1.4215
Durbin-Watson criterion	1.952

Source: authors' own calculations

Table 8

Estimated values of model testing for uniqueness and statistical significance

	Sum of squares (SS)	Degrees of freedom (df)	Mean square (MS)	Fisher's criterion (F)	Significance of the variable (p-value)
Regression	1548.22	3	516.07	24.84	0.001
Remainder	281.45	14	20.10		
Total	1829.67	17			

Source: authors' own calculations

an increase in the number of employed veterans by 0.084 thousand people, i.e. by 84 people, provided that the socio-economic situation remains unchanged;

2) The creation of one additional regional veteran adaptation center (X_2) leads to an increase in the number of employed veterans by 1.215 thousand people, which confirms the critical importance of developing support and adaptation of war veterans;
3) an increase in the salary (X_3) by 1 thousand UAH stimulates the increase in personnel and strengthens the integration of veterans by 432 people. To confirm the usefulness and benefits to the state from capitalizing on veteran potential, the potential growth in gross domestic product was calculated by reducing the veterans' unemployment rate from its current level of 31% to the optimally expected level of 7%. To determine the potential counter-growth in the country's GDP, the total number of veterans of working age (1.5 million) and the total number of employed people in the country (11.5 million) were taken into account. According to forecast calculations, the real gross domestic product for 2026 will be 160 billion USD.

Substituting the value into formula (1), we obtain the following:

$$L_{GDP} = 2 \cdot (0.31 - 0.07) \cdot \left(\frac{1.5}{11.5} \right) \cdot 160,$$

$$L_{GDP} = 10.01 \text{ billion USD}.$$

Thus, removing structural barriers and fully integrating veterans into the national economy can generate an additional approximately 10.01 billion USD (or over 6.2% of real GDP). This is a significant financial resource that fully covers all costs for social benefits, medical rehabilitation, and other benefits.

The results obtained confirm that the passive model of social protection of veterans, based exclusively on monetary compensations and subsidies, is economically inefficient and leads to the preservation of poverty and marginalization. Modern state policy should be based on three fundamental pillars of human capital integration:

Veteran Entrepreneurship. The adoption of the profile law on veteran entrepreneurship in 2025 (which entered into force on February 25, 2026) laid the legal basis for the creation of the State Target Program for Supporting Veteran Business for 2026–2028. The analysis shows that 27.1% of veterans want to start their own business. The provision of preferential microloans (for example, through expanding the «Affordable Loans 5-7-9%» program) and direct grants from the Ukrainian Veterans Fund will allow the creation of thousands of new microenterprises, which will, in turn, become employers for other combatants.

Professional retraining for the demands of Industry 4.0 and 5.0. There is an urgent need to adapt military skills (UAV management, cybersecurity, logistics, complex systems administration) to the needs of high-tech sectors. The state should stimulate voucher programs for studies at leading universities and IT academies, covering 100% of the cost of acquiring a new profession.

Corporate Inclusivity. Employers should receive tax preferences (e.g., reduced UCC rates or compensation for the costs of creating inclusive workplaces) when employing veterans, especially those who were disabled as a result of war. Civil society organizations and HR communities should develop uniform standards for veteran policies within companies.

Discussion. The results of the study, obtained through economic and mathematical modeling and statistical analysis, confirm that the veteran community in modern Ukraine is not a passive recipient of social transfers, but a key internal driver

and investor in the restoration of the state's human capital. The phenomenon identified during statistical monitoring warrants special scientific discussion: the recorded veteran unemployment rate of over 30% coexists with a critical labor shortage nationwide. The conducted study localizes this destructive gap in the plane of structural, skill and mental mismatches. The lack of relevant civil competencies and complex processes of psychological adaptation are exacerbated by the hidden prejudices of corporate management, which often perceives veterans through the prism of increased psychological or legal risks. The application of the modified Okun's law enabled these social destructions to be translated into clear macroeconomic calculations. Reducing the veteran unemployment rate from its current anomalous level to the natural target level (7%) could add $10.01 billion to Ukraine's real GDP (about 6.2% of total). This fundamentally changes the logic of state planning: budget financing of veteran programs, psycho-rehabilitation, and full inclusion of jobs should be qualified not as sunk social costs, but as strategic investments with a high level of macroeconomic return.

Another important aspect of the discussion is the rapid growth of entrepreneurial aspirations in the veteran community, with 27.1% of respondents expressing a desire to open their own business. The adoption and implementation of specialized legislation on veteran entrepreneurship has created the primary legal framework for this process. However, the monitoring results show that classic financial instruments (direct grants or subsidized loans of the «5-7-9%» type) without proper expert support are ineffective and carry a high risk of default for newly created businesses. To maximize the capitalization of veterans' human capital, it is advisable to move from point financial assistance to complex ecosystem models. The experience of OECD countries, adapted to Ukrainian realities, proves the need to introduce long-term mentoring, free legal support, and the creation of special veteran business networks. The integration model proposed in the paper (economic, mental, civic capacity, and positive social ties) proves that a sustainable economic effect is achieved only when state tax preferences operate in synergy with local infrastructure support.

Conclusions. Economic and statistical analysis has proven that the national human capital of Ukraine has suffered critical losses under the influence of the war. However, the return of veterans to civilian life creates a unique window of opportunity for qualitative renewal of the labor market, given their specific and highly qualified potential. A deep structural imbalance has been identified: the unemployment rate among veterans remains at 30.95%, amid a broader labor shortage. The main restraining factors are mismatches between skills and market demands and psychosocial barriers. The constructed correlation-regression model has demonstrated the high elasticity of reintegration processes to the expansion of the network of regional adaptation hubs and to the volume of financing for targeted retraining programs. Calculations based on the modified Okun's law have shown that the successful integration of veterans and a decrease in their unemployment rate can provide an additional increase in real GDP of Ukraine, exceeding 10 billion USD (6.2% of the total). This will allow us to determine that integrating veterans is a highly effective investment in national security and the country's economic development.

BIBLIOGRAPHY

1. Achieving Workplace Excellence Certification with Veteran-Friendly Practices // Most Loved Workplace. URL: https://mostlovedworkplace.com/achieving-workplace-excellence-certification-with-veteran-friendly-practices/

2. Актуальні потреби та бачення можливостей для кар'єрного і професійного зростання ветеранів: онлайн-опитування // Український ветеранський фонд. URL: https://veteranfund.com.ua/analitics/aktualni-potreby-ta-bachennia-mozhlyvostey-dlia-kar-iernoho-i-profesiynoho-zrostannia-veteraniv/

3. Бабічев А. В., Пелюх О. І. Стратегічні аспекти розвитку людського капіталу в Україні в контексті інтеграції ветеранів у сфери Індустрій 4.0 та 5.0. *Проблеми економіки.* 2024. № 3. С. 76–83. DOI: https://doi.org/10.32983/2222-0712-2024-3-76-83

4. Беккер Г. С. Людський капітал : теоретичний та емпіричний аналіз, з особливим акцентом на освіту. Нью-Йорк : Національне бюро економічних досліджень, 1964. 187 с. URL: https://www.nber.org/books-and-chapters/human-capital-theoretical-and-empirical-analysis-special-reference-education-first-edition

5. Центр економічного відновлення – платформа з відкритим кодом // Recovery.org.ua. URL: https://recovery.org.ua

6. Концепція Державної цільової програми з підтримки ветеранського підприємництва на 2026–2028 роки // Міністерство у справах ветеранів України. URL: https://mva.gov.ua/media/1/Проект_концепції.docx

7. Дерій Ж., Децюк Т., Захарін А. Людський капітал в умовах війни: виклики та можливості нарощування у контексті повоєнного відновлення. *Економічний простір.* 2025. № 208. С. 210–217. DOI: https://doi.org/10.30838/EP.208.210-217

8. Defense Ministry warns rehabilitation system at risk of collapse // i24NEWS. 2024. URL: https://www.i24news.tv/en/news/israel/defense/artc-defense-ministry-warns-rehabilitation-system-at-risk-of-collapse

9. European Social Fund Plus shows steady progress in 2021–2027 period // European Commission. 2025. URL: https://european-social-fund-plus.ec.europa.eu/en/news/european-social-fund-plus-shows-steady-progress-2021-2027-period

10. Guidelines on Labour Market Reintegration upon Return in Origin Countries // ILO. 2023. URL: https://www.ilo.org/publications/guidelines-labour-market-reintegration-upon-return-origin-countries

11. How's Life? 2024 // OECD. 2024. URL: https://www.oecd.org/en/publications/how-s-life-2024_90ba854a-en.html

12. Labour Market Reintegration of Return Migrant Workers and Former Refugees in Origin Countries: Concepts and Definitions // ILO. 2024. URL: https://www.ilo.org/sites/default/files/2024-05/Labour%20market%20reintegration_concepts%20and%20defnitions_.pdf

13. Левчук О. В., Кузьміч І. І. Військово-економічні аспекти застосування людського капіталу: проблеми та шляхи оптимізації. *Економіка та суспільство*. 2017. № 12. С. 110–116. URL: https://economyandsociety.in.ua/journals/12_ukr/17.pdf

14. OECD Guidelines for Citizen Participation Processes // OECD. 2022. URL: https://www.oecd.org/content/dam/oecd/en/publications/reports/2022/09/oecd-guidelines-for-citizen-participation-processes_63b34541/f765caf6-en.pdf

15. Статистичне моделювання та прогнозування : навч. посіб. для студентів ВНЗ / [Раєвнєва О. В. та ін. ; за ред. Раєвнєвої О. В.]; Харків. нац. екон. ун-т ім. С. Кузнеця. Харків : ВД « ІНЖЕК», 2014. 576 с.

16. Реінтеграція ветеранів – аналіз досліджень ринку праці GRC.ua // New Voice Бізнес. 2026. URL: https://biz.nv.ua/ukr/sviy-biznes/reintegraciya-veteraniv-kompaniji-zmenshili-zusillya-u-pracevlashtuvanni-viyskovih-50600859.html

17. Returning Home: Understanding the Perspectives of Veterans in Ukraine after the 24th of February 2022 // UNDP Ukraine. 2024. URL: https://www.undp.org/ukraine/publications/returning-home-understanding-perspectives-veterans-ukraine-after-24th-february-2022

18. Шульц Т. В. Інвестиції в людський капітал. *Американський економічний огляд.* 1961. Т. 51. № 1. С. 1–17. URL: https://www.jstor.org/stable/1818907

19. Strengthening the Human Capital of Forcibly Displaced Persons in and from Ukraine // OECD. 2024. URL: https://www.oecd.org/en/publications/strengthening-the-human-capital-of-forcibly-displaced-persons-in-and-from-ukraine_9afedf7c-en.html

20. System of National Accounts 2025 // United Nations Statistics Division. 2025. URL: https://unstats.un.org/unsd/nationalaccount/sna2025.asp

21. U.S. Department of Veterans Affairs: Annual Benefits Report // U.S. Department of Veterans Affairs. URL: https://www.benefits.va.gov/REPORTS/abr/

22. Ukraine Veteran Support // OECD. 2026. URL: https://www.oecd.org/content/dam/oecd/en/publications/reports/2026/06/ukraine-veteran-support_c5eaafb8/6e80787d-en.pdf

23. Серед ветеранів зростає рівень безробіття: дослідження // Український ветеранський фонд. 2024. 13 лют. URL: https://veteranfund.com.ua/2024/02/13/sered-veteraniv-zrostae-riven-bezrobitiia-doslidzhenia/

24. United Nations Sustainable Development Goals // United Nations. URL: https://sdgs.un.org/goals

25. Veterans Affairs Canada: Departmental Results Report // Veterans Affairs Canada. URL: https://www.veterans.gc.ca/en/about-vac/reports-policies-and-legislation/departmental-reports/departmental-results-reports/departmental-results-report-2024-2025

26. Veterans Benefits Administration Reports // U.S. Department of Veterans Affairs. URL: https://www.benefits.va.gov/REPORTS/abr/

27. Державна політика щодо ветеранів війни : аналіт. доп. / [Власенко Р. В., Гущук І. В., Жаліло Я. А. та ін.] ; за наук. ред. Я. А. Жаліла. Київ : НІСД, 2025. 118 с. DOI: https://doi.org/10.53679/NISS-analytrep

28. WHO / World Health Statistics // UNifeed. 2025. URL: https://media.un.org/unifeed/en/asset/d339/d3396187

29. World Bank Human Capital Index // World Bank. URL: https://humancapital.worldbank.org/en/indicator/WB_HCP_HCI

30. Зачосова Н. В. Основи політики збереження людського капіталу у воєнний та післявоєнний час для потреб економічного відновлення та зростання. *Науковий вісник.* 2023. № 11–12 (312–313). С. 17–28. DOI: https://doi.org/10.32680/2409-9260-2023-11-12-312-313-17-28

31. Залознова Ю., Азьмук Н. Людський капітал України в умовах війни: втрати та здобутки. *Економіка та суспільство.* 2022. № 38. DOI: https://doi.org/10.32782/2524-0072/2022-38-59

Фінансування: *Дослідження не отримувало зовнішнього фінансування.*
Конфлікт інтересів: Автори заявляють про відсутність конфлікту інтересів.
Внесок авторів (CRediT):
Серова І. А.: *концепція, дослідження ключових напрямків інтеграції ветеранів війни до відновлення; порівняльна характеристика світових моделей реінтеграції ветеранів; дослідження специфіки оцінки інтеграції ветеранів війни до відновлення людського капіталу.*
Бровко О. І.: методологія дослідження, аналіз поточної ситуації кількості безробітних ветеранів війни, дослідження існуючих бар'єрів при працевлаштуванні ветеранів, економіко-математичне моделювання в дослідженні; модифікація закону Оукена.
Вдячності: *Не передбачені.*
Використання ШІ: Інструменти ШІ у підготовці цієї роботи не використовувались.
Заява про оригінальність: Наданий матеріал раніше не публікувався та в інші видання не надсилався.

Funding: *This research received no external funding.*
Conflict of interest: The authors declare no conflict of interest.
Author contributions (CRediT):
Sierova I. A.: *concept, research of key directions for integrating war veterans into recovery; comparative analysis of global veteran reintegration models; research on the specifics of assessing the integration of war veterans into human capital recovery.*
Brovko O. I.: research methodology, analysis of the current situation regarding the number of unemployed war veterans, research on existing barriers to veteran employment, economic-mathematical modeling in the research; modification of Okun's law.
Acknowledgments: *Not applicable.*
AI use statement: No AI tools were used in the preparation of this work.
Originality statement: The submitted material has not been previously published and has not been submitted to any other journal.

REFERENCES

Babichev A. V. & Peliukh O. I. (2024). Stratehichni aspekty rozvytku liudskoho kapitalu v Ukraini v konteksti intehratsii veteraniv u sfery Industrii 4.0 ta 5.0 [Strategic aspects of human capital development in Ukraine in the context of integrating veterans into the spheres of Industry 4.0 and 5.0]. *Problemy ekonomiky*, *3*, 76–83. https://doi.org/10.32983/2222-0712-2024-3-76-83

Bekker H. S. (1964). *Liudskyi kapital: teoretychnyi ta empirychnyi analiz, z osoblyvym aktsentom na osvitu* [Human capital: theoretical and empirical analysis, with special emphasis on education]. Niu-York: Natsionalne biuro ekonomichnykh doslidzhen. https://www.nber.org/books-and-chapters/human-capital-theoretical-and-empirical-analysis-special-reference-education-first-edition

U.S. Department of Veterans Affairs. U.S. Department of Veterans Affairs: Annual Benefits Report. https://www.benefits.va.gov/REPORTS/abr/

U.S. Department of Veterans Affairs. Veterans Benefits Administration Reports. https://www.benefits.va.gov/REPORTS/abr/

Derii Zh., Detsiuk T. & Zakharin A. (2025). Liudskyi kapital v umovakh viiny: vyklyky ta mozhlyvosti naroshchuvannia u konteksti povoiennoho vidnovlennia [Human capital in conditions of war: challenges and opportunities for building up in the context of post-war recovery]. *Ekonomichnyi prostir*, *208*, 210–217. https://doi.org/10.30838/EP.208.210-217

European Commission. (2025). European Social Fund Plus shows steady progress in 2021–2027 period. https://european-social-fund-plus.ec.europa.eu/en/news/european-social-fund-plus-shows-steady-progress-2021-2027-period

i24NEWS. (2024). Defense Ministry warns rehabilitation system at risk of collapse. https://www.i24news.tv/en/news/israel/defense/artc-defense-ministry-warns-rehabilitation-system-at-risk-of-collapse

ILO. (2023). Guidelines on Labour Market Reintegration upon Return in Origin Countries. https://www.ilo.org/publications/

guidelines-labour-market-reintegration-upon-return-origin-countries

ILO. (2024). Labour Market Reintegration of Return Migrant Workers and Former Refugees in Origin Countries: Concepts and Definitions. https://www.ilo.org/sites/default/files/2024-05/Labour%20market%20reintegration_concepts%20and%20defnitions_.pdf

Levchuk O. V. & Kuzmich I. I. (2017). Viiskovo-ekonomichni aspekty zastosuvannia liudskoho kapitalu: problemy ta shliakhy optymizatsii [Military-economic aspects of human capital application: problems and ways of optimization]. *Ekonomika ta suspilstvo*, *12*, 110–116. https://economyandsociety.in.ua/journals/12_ukr/17.pdf

Ministerstvo u spravakh veteraniv Ukrainy. Kontseptsiia Derzhavnoi tsilovoi prohramy z pidtrymky veteranskoho pidpryiemnytstva na 2026–2028 roky [Concept of the State Targeted Program to Support Veteran Entrepreneurship for 2026–2028]. https://mva.gov.ua/media/1/Proekt_kontseptsii.docx

Most Loved Workplace. Achieving Workplace Excellence Certification with Veteran-Friendly Practices. https://mostlovedworkplace.com/achieving-workplace-excellence-certification-with-veteran-friendly-practices/

New Voice Biznes. (2026). Reintehratsiia veteraniv – analiz doslidzhen rynku pratsi GRC.ua [Reintegration of veterans – analysis of GRC.ua labor market research]. https://biz.nv.ua/ukr/sviy-biznes/reintegraciya-veteraniv-kompaniji-zmenshili-zusillya-u-pracevlashtuvanni-viyskovih-50600859.html

OECD. (2022). OECD Guidelines for Citizen Participation Processes. https://www.oecd.org/content/dam/oecd/en/publications/reports/2022/09/oecd-guidelines-for-citizen-participation-processes_63b34541/f765caf6-en.pdf

OECD. (2024). How's Life? 2024. https://www.oecd.org/en/publications/how-s-life-2024_90ba854a-en.html

OECD. (2024). Strengthening the Human Capital of Forcibly Displaced Persons in and from Ukraine. https://www.oecd.org/en/publications/strengthening-the-human-capital-of-forcibly-displaced-persons-in-and-from-ukraine_9afedf7c-en.html

OECD. (2026). Ukraine Veteran Support. https://www.oecd.org/content/dam/oecd/en/publications/reports/2026/06/ukraine-veteran-support_c5eaafb8/6e80787d-en.pdf

Raievnieva O. V. (2014). *Statystychne modeliuvannia ta prohnozuvannia: navch. posib. dlia studentiv VNZ* [Statistical modeling and forecasting: study guide for university students]. Kharkiv: VD « INZhEK».

Recovery.org.ua. Tsentr ekonomichnoho vidnovlennia – platforma z vidkrytym kodom [Center for Economic Recovery – open-source platform]. https://recovery.org.ua

Shults T. V. (1961). Investytsii v liudskyi kapital [Investment in human capital]. *Amerykanskyi ekonomichnyi ohliad*, *1*(51), 1–17. https://www.jstor.org/stable/1818907

Ukrainskyi veteranskyi fond. (2024, February 13). Sered veteraniv zrostaie riven bezrobittia: doslidzhennia [Unemployment rate is rising among veterans: research]. https://veteranfund.com.ua/2024/02/13/sered-veteraniv-zrostae-riven-bezrobitiia-doslidzhenia/

Ukrainskyi veteranskyi fond. Aktualni potreby ta bachennia mozhlyvostei dlia kariernoho i profesiinoho zrostannia veteraniv: onlain-opytuvannia [Current needs and vision of opportunities for career and professional growth of veterans: online survey]. https://veteranfund.com.ua/analitics/aktualni-potreby-ta-bachennia-mozhlyvostey-dlia-kar-iernoho-i-profesiynoho-zrostannia-veteraniv/

UNDP Ukraine. (2024). Returning Home: Understanding the Perspectives of Veterans in Ukraine after the 24th of February 2022. https://www.undp.org/ukraine/publications/returning-home-understanding-perspectives-veterans-ukraine-after-24th-february-2022

UNifeed. (2025). WHO / World Health Statistics. https://media.un.org/unifeed/en/asset/d339/d3396187

United Nations. United Nations Sustainable Development Goals. https://sdgs.un.org/goals

United Nations Statistics Division. (2025). System of National Accounts 2025. https://unstats.un.org/unsd/nationalaccount/sna2025.asp

Veterans Affairs Canada. Veterans Affairs Canada: Departmental Results Report. https://www.veterans.gc.ca/en/about-vac/reports-policies-and-legislation/departmental-reports/departmental-results-reports/departmental-results-report-2024-2025

Vlasenko R. V., Hushchuk I. V. & Zhalilo Ya. A. (2025). *Derzhavna polityka shchodo veteraniv viiny: analit. dop.* [State policy regarding war veterans: analytical report]. Kyiv: NISD. https://doi.org/10.53679/NISS-analytrep

World Bank. World Bank Human Capital Index. https://humancapital.worldbank.org/en/indicator/WB_HCP_HCI

Zachosova N. V. (2023). Osnovy polityky zberezhennia liudskoho kapitalu u voiennyi ta pisliavoiennyi chas dlia potreb ekonomichnoho vidnovlennia ta zrostannia [Fundamentals of the human capital preservation policy in wartime and post-war period for the needs of economic recovery and growth]. *Naukovyi visnyk*, *11–12 (312–313)*, 17–28. https://doi.org/10.32680/2409-9260-2023-11-12-312-313-17-28

Zaloznova Yu. & Azmuk N. (2022). Liudskyi kapital Ukrainy v umovakh viiny: vtraty ta zdobutky [Human capital of Ukraine in conditions of war: losses and achievements]. *Ekonomika ta suspilstvo*, *38*. https://doi.org/10.32782/2524-0072/2022-38-59

Стаття надійшла до редакції 03.06.2026 р.
Статтю прийнято до публікації 19.06.2026 р.
Оприлюднено 11.08.2026 р.