

Victoriia Overchuk ¹
Viktor Zvonar
Olena Koval
Mykola Pugachov
Olena Kyselova
Mykhailo Goncharenko

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CHANGES IN HUMAN CAPITAL CAUSED BY THE RUSSIAN- UKRAINIAN MILITARY CONFRONTATION

Abstract: *The results of the study indicate significant changes in human capital due to the military confrontation with the Russian Federation. It was established that the human capital in the pre-war period was characterized as highly educated and qualified, which is proved by high indices in the international talent competitiveness rating (61st place out of 155 countries), however, during the war period there was a significant loss of human capital, which was estimated at 4031 thousand killed, 4735 thousand wounded, 1 million 2 thousand forcibly deported to the Russian Federation, 13.7 million displaced, of whom 5.7 million people left the country. In order to overcome the crisis situation it is suggested to point the main ways of preservation and post-war restoration of human capital in the direction of: creating appropriate conditions to stimulate the return of citizens to Ukraine, the development of effective programs of post-war restoration of human capital and its sustainable development in Ukraine, as well as providing free and unimpeded access to educational services with opportunities for participation of applicants in international projects and programs.*

Keywords: *human capital, human development index, human capital losses, post-bellum development of human capital, Russian-Ukrainian military confrontation.*

1. Introduction

The military aggression of the Russian Federation against Ukraine poses a significant threat to human capital, which is manifested in its heavy losses, a decline in the level of education and professional training due to the impossibility of providing educational services and relocation of the population abroad. The key parameters of human capital are assessed by the level of education, ingenuity, creativity, self-

development, motivation and skills, which simultaneously affect the socio-economic and technological growth of the national economy and the sustainable development of society. In this context, the problem of an in-depth study of changes in human capital under the influence of the war in Ukraine has become urgent. In scientific works it is emphasized as a set of clearly formed productive capabilities, obtained as a result of investment, personal traits and motivations of individuals. It is worth noting that among the main losses of human capital

¹ Corresponding author: Victoriia Overchuk
Email: v.oveerchuk@donnu.edu.ua

at the present stage the problem of military deaths, significant losses of the civilian population, the forced removal of Ukrainian citizens to the territory of the aggressor country, increased external and internal migration, as well as forced resettlement is particularly acute. These trends indicate the inability to fully use human capital and need immediate solutions to the issues associated with it.

The study aims to identify the key trends in changes of human capital caused by the Russian-Ukrainian military confrontation and to determine the main directions of its recovery during the period of post-bellum reconstruction.

The theoretical section of the research reflects an overview of existing scientific approaches to determining the essence of human capital and changes taking place in relation to it under the influence of armed military operations on the territory of Ukraine. The basic destabilizing factors and causes of loss of human life as a result of increased instability, danger and emergence of significant social-political and social-economic threats were analyzed (Kostiukevych et al., 2020; Ostapenko et al., 2020). Nalbandian, M.A. (2018). The interdependence and interconditionality of developing human capital and the growth of the country's sustainable development were substantiated.

The practical part of the research is based on proving the influence of negative factors caused by Russia's war against Ukraine on changes in human capital. It establishes Ukraine's place among European countries in terms of common signs of human capital development in the pre-war period and during the war. Along with this, it reveals a decrease in the values of the main quantitative indicators of human capital in Ukraine in conditions of instability and uncertainty. The conducted studies made it possible to establish that the Russian-Ukrainian war led to the intensification of the migration crisis and the mass movement

of the population from Ukraine to the European Union's states. In addition, the research estimates the loss of human capital as a result of Ukraine's military confrontation with the Russian Federation. They are estimated at 13,7 million people who were forcibly displaced, including 5,7 million people left the country, of which 2,5 million were education seekers; 1 million 2 thousand people, of which 183 thousand 168 children were forcibly deported to the territory of Russia; 8766 people, including 4031 people were killed, including 261 children; 4735 people were injured, including 406 children; massive destruction and annihilation of educational infrastructure is observed, namely: 621 kindergartens, 1123 educational institutions worth 2078 million US dollars. The assessments were carried out using modern methods of economic analysis and innovative software packages, in particular Statistica, 7,0.

The paper aims to identify the main trends in human capital changes caused by the Russian-Ukrainian military confrontation and to determine the main directions of its restoration during the post-war reconstruction.

2. Literature Review

The problematic aspects of human capital research under conditions of war in Ukraine are in the focus of scientists' attention. However, they have not received proper consideration to the full extent due to the short period for making the necessary calculations. Significant developments in the outlined direction have been carried out by the National Institute for Strategic Studies, whose experts have formed an analytical report, which reflected the information about the loss of human capital (Zhalilo et al., 2022). In today's world human capital is a considerable potential for the country's development, because due to its capabilities, it is a full-fledged economic agent (Koval et al., 2021). The Ukrainian institute of future human capital of the state is considered as a

set of knowledge, necessary skills and experience of people, which contribute to their economic value, compliance with current and future trends and social needs, as well as prospects for strategic development (The importance of human capital development in the modern world 2021).

Zhalilo et al. (2018) have investigated the influencing factors of human capital formation in Ukraine and have determined that education, health care, social policy and migration processes are the determinants of its formation. At the same time, the researchers note that the sustainable development of human capital is possible with the reform of the main spheres of the economy and social life. At the same time, the researchers have revealed the inconsistency of the methodology of human capital measurement with modern requirements, since the available approaches to the assessment are contradictory and do not take into account the issues of identification of assessment goals and cost assessment of its qualitative parameters.

Nalbandian, M.A. (2018) has characterized human capital by the processes of its continuous development and continuous improvement of intellectual, labor and physical abilities of a person. Tereshchenko (2019) believes that in this case, the factor of innovation and technological challenges in education is of great significance. Agreeing with the views of researchers, Angrist et al. (2022) believe that factors due to war and military conflicts lead to a significant loss of human capital, especially in relation to education applicants. Researchers rate the state of education in Ukraine as among the lowest in Europe and suggest intensifying distance education form, as well as creating more opportunities for refugees from Ukraine in the countries to which they have relocated.

Zhang et al. (2022) have identified the interdependence of human capital on a national development level and believe that the obstacles to human capital development

in developing countries are greater than those in developed countries.

Peregrine et al. (2022) have concluded when studying the problems of human capital that its significant changes have first appeared during the strengthening of the COVID-19 pandemic and in the conditions of 2022 have only intensified. This is evidenced by changes in workforce strategies, its flexibility, digital transformation and the need to reorient to remote ways of working. Skye (2022) has emphasized several factors driving the irreversibility of human capital changes, including (1) the intensification of automated technology adoption processes; (2) adaptation to long-term remote work opportunities; and (3) workers' welfare payments in the face of incomplete productivity. Arina (2022) agrees with the scientists that under modern conditions the development of human capital is headed in the direction of focusing on the needs of people, in particular, their financial security. Chiang & LaBelle (2022) attribute changes in human capital to the pursuit of higher welfare levels. Whereas the uneven distribution of income among the population is the cause of the ambiguity of human capital development.

Bondarchuk & Paustovska (2022) associate the qualitative development of human capital with an increase in the efficiency of the national economy and the strengthening of the country's competitiveness at the international level. Ragulina (2022) agrees with this point of view. She believes that a modern human capital management system should be innovation-oriented and meet modern requirements.

Zaloznova & Azmuk (2022) describe Ukraine's human capital as highly qualified, educated and motivated. In addition, scholars have noted that under the influence of the war with the Russian Federation, significant structural changes in human capital have taken place. As a result they assess direct (forced migration, forced deportation, military deaths and the killing of civilians)

and indirect (non-receipt of income by enterprises, lower wages for employees, inability to fully realize intellectual abilities and creative potential, insufficient level of investment in human capital caused by the destruction of educational infrastructure, inability to obtain educational services) losses of human capital. It is worth noting the strategic directions of restoration of human capital in the post-bellum period, outlined by Zaloznova & Azmuk (2022), the priorities of which are: (1) restoration of civil infrastructure and housing stock, (2) development of programs to encourage the development of business structures and self-employment, (3) implementation of psychological support programs, (4) reforming the national education system, (5) formation of strong university centers and ensuring their integration into the business environment, (6) development of the national education system.

Assessing the existing problems with regard to human capital and its changes as a result of the Russian-Ukrainian military confrontation, it must be stated that threatening destabilizing factors have formed in Ukraine, which have a destructive effect on human capital and need to find effective ways out of the crisis.

3. Methodology

Empirical studies of the state and trends in developing human capital in Ukraine and the identification of its changes as a result of the Russian-Ukrainian military confrontation were carried out by using the methods of economic analysis and scientific knowledge in assessing the value of the human development index, the talent competitiveness index, the loss of human capital as a result of the military confrontation and the education level. The research was conducted with the aim of determining the principal directions of human capital recovery during Ukraine's post-war reconstruction. The relevant calculations were carried out using the

Statistica 7,0 software package by processing the reporting data of domestic and international organizations.

The methodological basis of the study consists of such methods as analysis and synthesis used in the study of theoretical and applied foundations of human capital in order to define the essence of the economic category "human capital", the comparative and analogy approach in the implementation of empirical assessments of indicators characterizing human capital parameters and allowing to identify its changes as a result of the Russian-Ukrainian military confrontation, method of generalization and systematization in order to form hypotheses and formulate conclusions and research results, k-means cluster analysis for grouping countries by human development index, graphical and tabular methods for visualization of the obtained research results.

The infobase of the study consists of reports for 2017-2021: Human Development Report on the Human Development Index; The Global Talent Competitiveness Index on the Talent Competitiveness Index; and the World Migration Report on migration outflows.

4. Results

The Russian-Ukrainian military confrontation and the deployment of military operations on a large territory of Ukraine has entailed a series of destabilizing factors in the life of the population, which resulted in the reformatting of socio-economic and socio-political life. These trends had a particularly adverse impact on the human capital development, causing significant destructive changes, slowing development, increasing losses and actualizing the need to struggle to preserve it. The new challenges of modernity and the realities of war have created an ambiguous situation for human capital, much of which has migrated outside of Ukraine, while others are forced to seek opportunities to realize their potential in the

peaceful territory of the country. Obviously, this ambiguous situation is not conducive to positive change and needs in-depth research to find ways out of the crisis state.

The pre-war period characterizes the human capital of Ukraine with rather high values of its parameters, as evidenced by the country's position in international rankings, in particular regarding the Human Development Index. It is worth noting that in order to determine the dominant role of human capital in the evaluation system of the country's economic development, the Human Development Index is calculated as an integral indicator adopted by the international community for interstate comparison of human potential characteristics according to such criteria as living standards, education, literacy and life

expectancy. It is reasonable to explore the dynamics of this indicator in Ukraine, which is suggested in the context of comparison with the value of the main countries of the world. There are countries, which have received the largest number of internally displaced persons under the conditions of increasing danger on the territory of Ukraine. In particular, it is necessary to involve Poland (27.7%), the Czech Republic (11.5%), Hungary (7.31%), Germany (6.44%), Romania (5.9%), Moldova (5) (9%), Slovakia (3.2%), Italy (2.5%), Turkey (2.1%) and Egypt (1.8%), to whose territory the majority of persons from Ukraine moved due to the war. Figure 1 shows the dynamics of the Human Development Index in Ukraine and in selected European countries in 2017-2020.

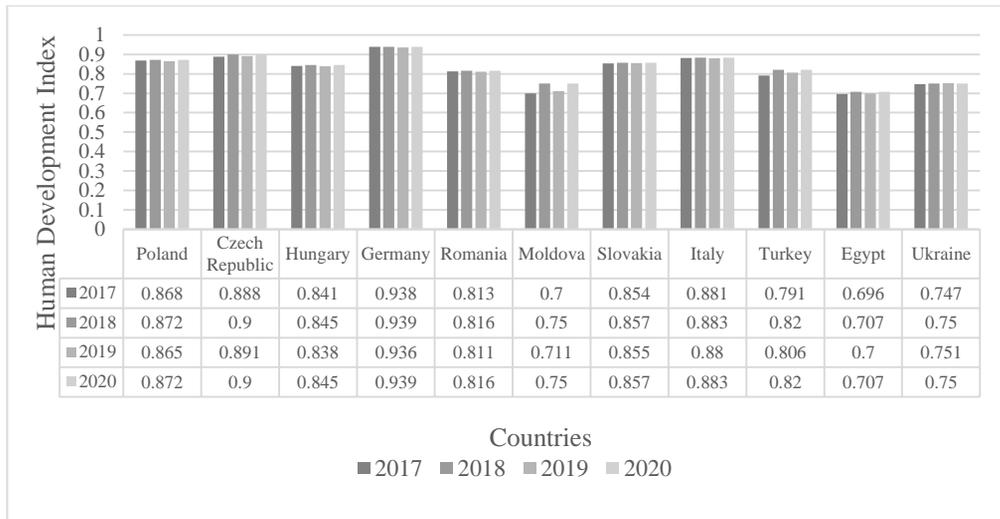


Figure 1. The dynamics of the Human Development Index in Ukraine and in selected European countries in 2017-2020.*

Calculated by: *Human Development Report 2017–2020*.

* The 2021-2022 report will be published on September 8, 2022.

According to the research results in the pre-war period, the dynamics of the human development index in Ukraine has a slight upward trend, however it is significantly lower compared to that in the EU countries. Germany has the highest human

development index (0.936-0.939) whereas Egypt has the lowest (0.696-0.707).

In-depth studies make it possible to group selected countries according to the human development index, which can be achieved through a k-means cluster analysis (Table 1).

Table 1. Grouping of European countries by Human Development Index in 2017-2020.

2017		2018		2019		2020	
Country	Cluster number						
Poland	1	Poland	1	Poland	1	Poland	1
Czech Republic		Czech Republic		Czech Republic		Czech Republic	
Hungary		Hungary		Hungary		Hungary	
Germany		Germany		Germany		Germany	
Romania		Slovakia		Romania		Slovakia	
Slovakia		Italy		Slovakia		Italy	
Italy		Romania		Italy		Romania	
Moldova		Moldova		Turkey		Moldova	
Turkey	2	Turkey	2	Moldova	2	Turkey	2
Egypt		Egypt		Egypt		Egypt	
Ukraine		Ukraine		Ukraine		Ukraine	

Calculated by: Human Development Report 2017–2020.

Therefore, in the process of analysis it is revealed that among the countries actively cooperating with Ukraine in human capital allocation, there are two groups: the European Union countries, positioning the highest values of the human development index, and other countries that are not part of the European Union and have lower values of the human development index.

Obviously, the problem of preservation of human capital, its financing and restraint of external labor migration arises under war conditions. Human capital in Ukraine is characterized as highly educated and

qualified, which is confirmed by the global rating of talent competitiveness, according to which Ukraine ranked in 2021. 61st place among 155 countries studied (Figure. 2) and among the countries of the analyzed group demonstrates the average value of the Talent Competitiveness Index. It should be noted that in conditions of war and protracted uncertainty the value of the analyzed index in 2022 will tend to decrease, which is justified by unfavorable conditions of talent development and their movement outside the country.

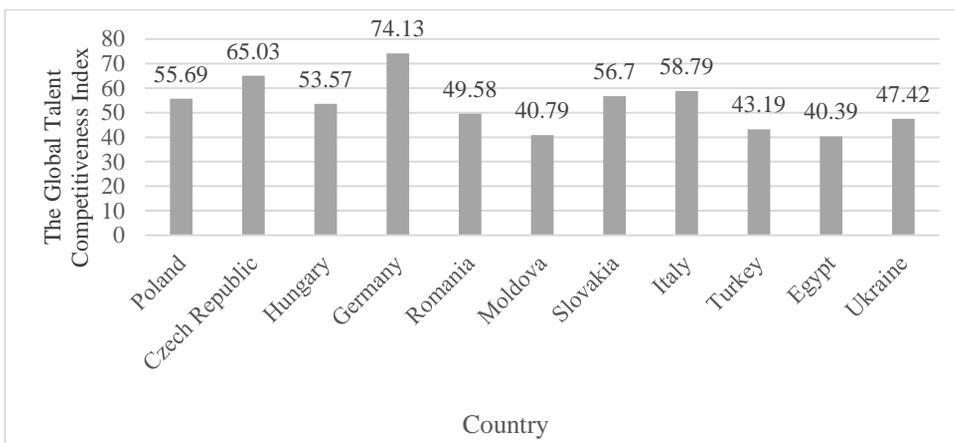


Figure 2. Dynamics of the Talent Competitiveness Index in Europe in 2021
 Calculated by: The Global Talent Competitiveness Index 2021

The calculation of its quantitative indicators, systematized in Table 2, is of great significance in the study of human capital. Please note that empirical estimates can only

be carried out in the pre-war period, because statistical generalizations of the data in 2022 do not take place.

Table 2. The main quantitative indicators of human capital in Ukraine in 2017-2021

Indicator	2017	2018	2019	2020	2021
Birth rate, thousands of people	363,97	335,8	308,8	293,4	272,0
Natural population increase (decrease), thousands of people	-210,1	-251,7	-272,2	-323,3	-442,3
Average age of population, years	41,1	41,3	41,6	41,8	40,1
Workforce, thousands of people	17854,4	17939,5	18066	17589,5	17400,0

Calculated by: Population. State Statistics Service of Ukraine

Thus, it can be stated that the birth rate in Ukraine is decreasing, in particular, in 2017 it was 363.97 thousand people, and as of 2021 - 272 thousand people. Accordingly, the natural population growth also tends to go downward, as evidenced by the decline in the population. Speaking of the period of 2022, these processes have deepened even more against the background of forced deportation and forced relocation of a large proportion of the population outside the country. Migration outflow of human capital has been a significant problem for a long time, as evidenced by the data of the Migration Report 2020 (World Migration Report 2020, 2022), according to which 12.2% of the total population of Ukraine are emigrants, which reached the mark of 6.05 million people. The main factors of large-scale labor migration in the pre-war period are higher wages than in Ukraine. However, in 2022 the priorities have changed remarkably and the key factor of population movement to other countries of the world is the search for a safe place of residence. According to estimates of the International Organization for Migration, released in early May 2022 (Ukraine - Displacement Report, 2022) the total number of displaced population is 13.7 million people, of which 5.7 million people have moved to other countries. At the same time in the pre-war period the average age of the population in Ukraine was 41 years, and in 2021 it decreased to 40.1 years. As for the number of labor force, the value of this indicator

tended to increase in 2017-2019, and in 2020-2021 began to decline.

At the same time it must be noted that the majority of displaced persons seek to realize their own professional opportunities and are in search of work, regardless of their place of residence, which indicates that human capital shifts the vector of its location and there is a situation when highly qualified workers, having left the country, find highly paid work and develop their potential in the interests of another country. Only 4% of emigrants plan to return to Ukraine.

A similar situation is observed to education applicants located in safe territories, receiving unimpeded access to education and employment. According to the calculations of international organizations, 40% of students and pupils are outside of Ukraine, which poses a great threat to the loss of human capital.

Undoubtedly, changes in human capital as a result of the Russian-Ukrainian military confrontation have occurred and, it must be said, are substantial, which is confirmed by the data systematized in Table 3, according to which Ukraine has lost 4,031 people to the war only according to official data, who were cynically killed by the aggressor country, and over 1 million two thousand people were forcibly deported to the Russian Federation. Since men, aged 18 to 60 years old are banned from leaving the country, women and children predominate among those displaced to other countries.

Table 3. Human capital losses caused by Ukraine's military confrontation with the Russian Federation

Types of human capital losses	Volumes of human capital losses	Data source
Forced population displacement	13.7 mln. people, including 5.7 mln. people outside the country	According to Ukraine - Displacement Report 2022. IMO as of 03.05.2022.
Forced deportation to Russia	1 mln. 2 thous. people	According to the media (Dinyak, 2022) as of April 28, 2022.
Civilian casualties	8,766 people, including 4,031 people killed, 4,735 people wounded	According to the data of the Office of the UN High Commissioner for Human Rights (Ukraine: civilian casualties as of May 26, 2022) the real losses are much higher, but there is no possibility to obtain information from the territories where active hostilities are taking place as of May 29, 2022.
The destruction of educational infrastructure	621 kindergartens, 1,123 educational institutions at a cost of \$2,078 mln. U.S.	Losses of Ukraine's economy as of 27.05.2022

Author's development

According to estimates of international organizations 2.5 million people who are outside of Ukraine are students and schoolchildren, which is 43.71% of applicants of different levels (World Migration Report 2020). In addition, more than 22,000 Ukrainian teachers have moved to neighboring countries. This situation indicates a significant threat of loss of human capital by an average of 40%. At the same time, it should be noted that in the pre-

war period the Ukrainian education system could compete with European countries (Fig. 3), but the military confrontation and the deployment of war increased the loss of human capital among young people, including through the quality of educational services, which, according to estimates Angrist et al. (2021) is about 10%, and in general the national education system ranks the lower of the lowest in Europe (Figure. 4).

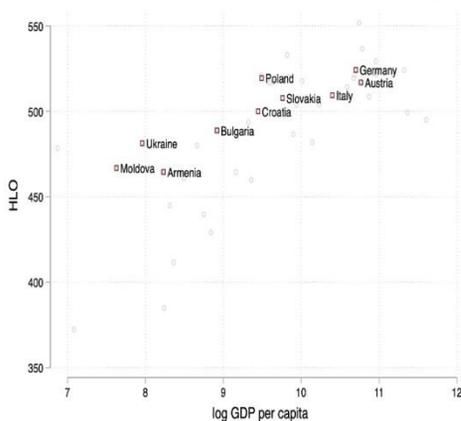


Figure 3. Estimates of the education level in Ukraine in the pre-war period

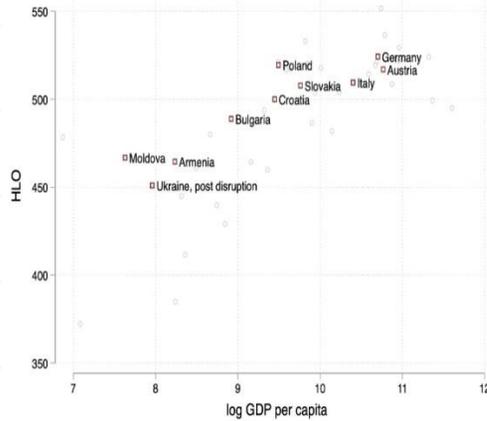


Figure 4. Estimates of the education level in Ukraine during the war period

Calculated by: Angrist et al. (2021)

Please note that the data reflected on human capital losses is not final and definitive. Given the impossibility of obtaining information from a large part of the country, which is under occupation and subject to massive active combat operations, it is impossible to fully assess the situation at

present. What is clear is that the losses are unambiguously greater and the changes in human capital are greater. Figure 5 systematizes the main changes in Ukraine's human capital as a result of the war with the Russian Federation.

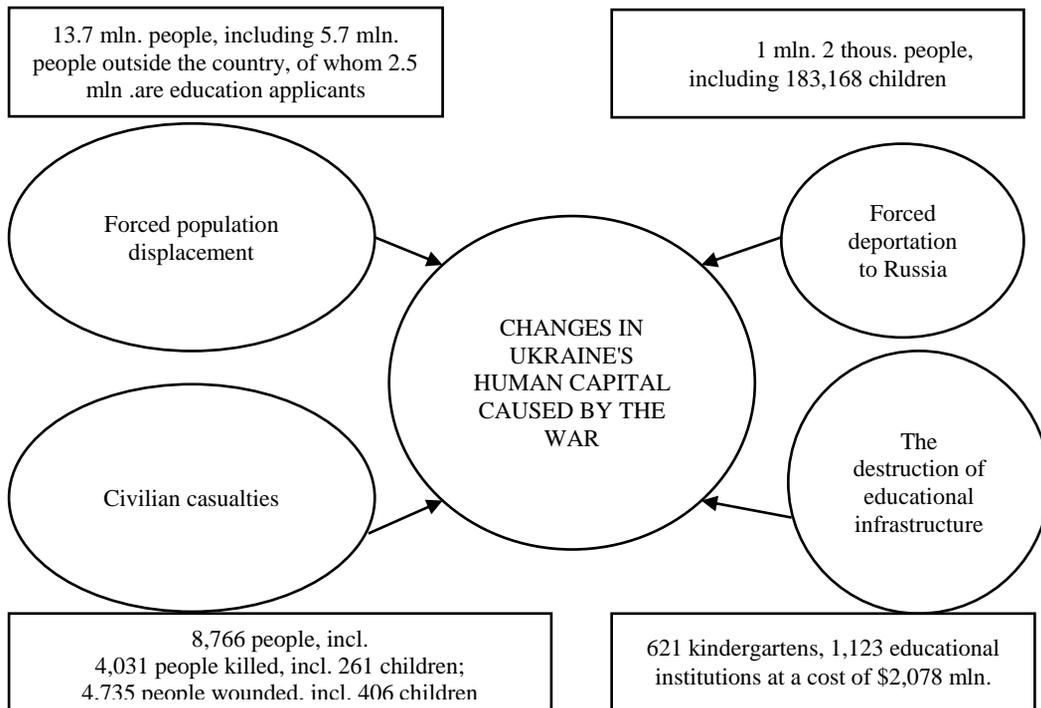


Figure 5. Changes in Ukraine's human capital caused by the war with the Russian Federation
Systematized by the authors

The problems outlined determine the need to find effective ways out of the situation that has developed in Ukraine regarding human capital. Of primary importance, in this context, is solving the issue of post-war restoration of human capital, in particular, the return of citizens to Ukraine and the construction of an effective system of formation and development of human capital on the territory of the country. In order to implement the proposed, it is necessary to restore housing stock and civil infrastructure, develop programs to stimulate the development of self-employment and business, as well as the implementation of a

program of psychological support of the population.

Significant factors in the preservation and restoration of human capital in war and post-war reconstruction can be: (1) the opening of specialized classes and the quality of education outside of Ukraine; (2) the creation of additional schools in the peaceful territory of Ukraine, where there is a need to provide educational services to internally displaced persons; (3) the active involvement of innovative digital technologies in the provision of educational services in a distance and mixed mode; (4) adapting curricula to the conditions of the educational

process; (5) encouraging emigrants of employable age to return to Ukraine.

5. Discussion

The intensification of Russia's military aggression against Ukraine clearly demonstrates a series of destructive changes in human capital. By virtue of the human capital, in the pre-war period the country has built a capable army, was able to define geopolitical vectors of development, provide the basis for economic reform, its modernization, the building of basic principles of democracy and the rule of law. However, the events after February 24, 2022 caused serious problems for the further sovereign development of the country and threatened its interests in all spheres of social life. The most acute issues were the loss of territorial integrity and natural resources, significant financial losses in payments to the budget, loss of productive capacity and position on international markets, deterioration of the investment climate and human potential losses.

Undoubtedly, the accumulation of geopolitical threats significantly reduces the level of economic development and creates problems of social tension and cohesion. It is obvious that human capital is the basis for the development of the country's economy, and in the post-war period it should become a tool to ensure sustainable development. Modernization of the national education system should play an important role in the system of post-war restoration of human capital in the direction of strengthening its digital security and formation of powerful educational centers, as well as in ensuring equality and accessibility of educational process participants to educational services.

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The restoration and development of human capital in the post-war period in international projects and programs will significantly strengthen.

6. Conclusion

Thus, the results of the study of the main trends of changes in human capital caused by the Russian-Ukrainian military confrontation and the determination of the main directions of its restoration during the post-war reconstruction allow us to draw certain conclusions. Under the impact of the war in Ukraine, human capital has undergone significant destructive changes, manifested in the loss of human resources, the movement abroad of a large share of the population, limited access to educational services and the inability to realize the available potential fully. It was established that in the pre-war period the human capital was characterized by a high level of qualification and development. Since the full-scale invasion of the Russian Federation, its significant losses were observed, including: 4031 thousand persons killed, 4735 thousand persons wounded, 1 million 2 thousand persons forcibly deported, 13.7 million persons displaced, of which 5.7 million persons to the territory of other countries. These tendencies need immediate elaboration of effective mechanisms for preservation and development of human capital. The return of emigrants to Ukraine and the formation of an effective system of human capital development on the territory of Ukraine with the involvement of international experience are defined as priorities for the post-war restoration of human capital.

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Victoriia Overchuk

Vasyl Stus Donetsk National University, Vinnitsa, Ukraine
v.overchuk@donnu.edu.ua
ORCID 0000-0002-7744-9346

Viktor Zvonar

Borys Grinchenko Kyiv University, Kyiv, Ukraine
viiktorzvonar@yahoo.com
ORCID 0000-0003-1300-4791

Olena Koval

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Kyiv, Ukraine
eminalena55@gmail.com
ORCID 0000-0002-6016-8222

Olena Kyselova

Sumy State University, Sumy, Ukraine
lenakiseleva2008@gmail.com
ORCID 0000-0002-5625-0952

Mykhailo Goncharenko

Interregional Academy of Personnel Management, Kyiv, Ukraine
goncharenkomf@ukr.net
ORCID 0000-0002-9193-9202
